FOUNDRY TRADE JOURNAL

Established 1902

Vol. 92 Thursday, March 27, 1952 No. 1856

PRINCIPAL CONTENTS

	PAGE
Features	
Leader: Clearing the Air	321
Notes from the Branches	330
Book Reviews	336
Publications Received	344
New Catalogues	344
Forthcoming Events (Advert. section)	27
Technical	
Sphercidal-graphite Iron Up to Date, by W. W. Braidwood	323
One-piece *v.* Composite Pattern Construction, by "Chip"	329
Further Mechanical Aids for the Foundry, by A. S. Beech	331
Handling and Lifting—their Hazards and Prevention, by A. Taylor	337
News	
Permanent Birmingham Exhibition	322
Papers for 1953 I.B.F. Conference	322
A.F.S. Awards	322
Old Glasgow Foundry Sold	330
Opaque-stop Microscope	340
B.S. Code for Sampling and Analysis of Flue Gases	340
United Steel Companies' Plans	340
Unemployment Rise Continues	340
Diesel Engines in Canada	341
News from Norway	341
International Nickel's Record Year	342
Personal	342
Obituary and Recent Wills	343
Internally Coating Underground Pipes	343
News in Brief	346
Raw Material Markets	348
Statistics	
Current Prices of Iron, Steel, and Non-ferrous Metals (Advert. section)	26

PUBLISHED WEEKLY: Single Copy, 9d. By Post 11d. Annual Subscription, Home 40s., Abroad 45s. (Prepaid).
49, Wellington Street, London, W.C.2. 'Phone: Temple Bar 3951 (Private Branch Exchange) Grams: "Zacatecas, Rand, London"

Clearing the Air

Last week, there were several unsubstantiated statements in the daily Press as to future steel deliveries and scrap collection. This made it necessary last Friday for the following statement to be issued: "The British Iron and Steel Federation does not support the statement attributed to an official of the Federation at a meeting in Birmingham yesterday that there will be a surplus of steel, other than alloy steel, later in the year. In the view of the Federation, although supplies are likely to improve in the second half of the year, steel will continue to be scarce."

There was also printed a story which might be interpreted that the scrap drive propaganda issued by the Federation was not too good and moreover was expensive. This is far from the truth and for the past two months of this year, collection of steel scrap has been on an average weekly basis 2,400 tons above last year's. Improved prices no doubt had an effect. This welcome increase in steel scrap salvage, has also resulted in higher cast-iron collection. Our view is that the scrap drive has been very intelligently conducted and the foundry industry has derived much benefit from it. Letters to the Press, both national and local, show that the general public is becoming scrap minded—although many of the suggestions made are not economic.

What is economic, is the salvaging of the scrap lying about in the yards and shops of the average foundry. If what is just about the tidiest foundry in the country can rescue in one year 100 tons of waste material, then what is a reasonable figure to hope for in the more untidy ones? There exist foundries, where it is found easier to make a new large-size moulding box, rather than dis-inter one from a huge pile in the yard. This problem is best resolved, not by a tour by the leading executive, but by using any means available to him to interest in the campaign every foreman in the organization. An assurance could be given that the scrapping of a discarded piece of equipment that seemed likely to "come in handy" (and actually might indeed later be wanted) would not be the subject of a controversy. Also, it might usefully be pointed out that the value of the total salvage won would easily pay for odd replacements. Moreover, some allowance for extra labour should not be frowned upon. It is appropriate at this time of the year that a thorough spring-cleaning should be undertaken in the works as well as in the homes. Both invariably reveal quantities of unwanted junk. In foundries, it is often not only a question of metallic scrap, but there are often accumulations of sacks, waste paper, packing cases, obsolete patterns, tin cans and the like. All these nowadays are valuable raw materials for bolstering-up the general economy of the country, apart from which their salvage makes the foundry "a better place in which to work"—to misquote the well-known American slogan.

Permanent Birmingham Exhibition

Birmingham is to establish a permanent industrial exhibition, which is sponsored by the Midland area members of the National Union of Manufacturers, and will be made available to manufacturers from all parts of the country. Mr. W. G. Blackwell, chairman of the Midland area of the N.U.M., states that the Birmingham Corporation have agreed to restore, redecorate and lease to the N.U.M., premises in John Bright Street, Birmingham, for an initial period of five years.

It is hoped that the exhibition, which has the full support of the Board of Trade and the Ministry of Supply, will be open by December 1 this year, and it is emphasized that it will not be in competition with the B.I.F. but complementary to it. Mr. F. L. Wraight, chairman of the exhibition committee, says that a large number of applications for space have been received from manufacturers in the Midlands and elsewhere, and added that all profits of the exhibition will be allowed to accumulate until they can finance a permanent exhibition on a much larger scale.

The Birmingham premises will also serve as the Midland headquarters of the N.U.M., and there will be suitable provision for buyers, including a canteen and a car park.

Papers for 1953 I.B.F. Conference

The Council of the Institute of British Foundrymen is prepared to receive offers of papers for presentation at the fiftieth annual conference to be held in June, 1953. The invitation is issued earlier than is usual, as it has been found necessary to arrange the conference programme earlier than in past years, and manuscripts will be required not later than December 31, 1952. The Council wishes to emphasize that it will be particularly pleased to have the opportunity to consider papers of a practical character. Members and non-members who contemplate offering papers are asked to communicate immediately with the secretary of the Institute, who will forward them a copy of the Institute's publication, "Notes for the Guidance of Authors of Papers." It is desirable that all formal offers of papers should be sent to the secretary not later than June 1, so that they can be considered at a meeting of the appropriate committee later that month.

Dinner

INSTITUTE OF METALS

On Wednesday Dr. C. J. Smithells, M.C., presided over the Annual Banquet of the Institute of Metals. This function was held at the Park Lane Hotel, and was followed by dancing. Amongst those present were Mr. A. S. Quartermaine, Sir Lewis Fermor, Major P. L. Teed, Mr. G. L. Bailey, Dr. S. F. Dorey, Mr. A. B. Graham, Prof. André Guinier, Dr. A. D. Merriman, Prof. A. J. Murphy, Dr. J. G. Pearce, Sir Eric Rideal, Mr. G. Shaw Scott, and Prof. Dr. A. von Zeerleder, most of whom were accompanied with their ladies.

THE CAPTION "Tin and Copper: both are bad, together they're worse" has been used by the *Iron Age* for heading an article by Mr. S. L. Gertsman and Mr. H. P. Tardip. The researches detailed refer to rolled products and the article appeared in the issue of February 14.

A.F.S. Awards

Amongst the recipients of awards to be made at the International Conference to be held in Atlantic City, U.S.A., from May 1 to May 7, Mr. H. Morrogh, research manager, British Cast Iron Research Association, is to receive the William H. McFadden medal for outstanding work and development in the field of spheroidal-graphite cast iron; Professor Portevin, of Paris, receives the Joseph S. Seaman medal for his great contributions to foundry technology. Mr. F. G. Steinebach, Editor of "Foundry," has been given the John A. Penton medal for outstanding contributions "to the foundry industry and to the Society." Finally, Mr. A. P. Gagnebin and Mr. K. D. Mills, of the International Nickel Company, jointly receive the Peter L. Simpson medal with a citation similar to that quoted for Mr. Morrogh. Three honorary memberships have been awarded to Mr. Walter L. Seelbach, immediate past president; Mr. A. Krynitsky (National Bureau of Standards), and Mr. William G. Nixen (foundry consultant).

Specifications for Stainless Steel

The Institution of Chemical Engineers has organized a meeting on April 1, at 2.30 p.m., in the apartments of the Geological Society, Burlington House, Piccadilly, London, W.1, which takes the form of a symposium on simplification in stainless steel specifications, with Dr. F. A. Freeth, vice-president, in the chair.

The programme includes lectures by the following:—Mr. J. L. Sweeten (Metal Propellers, Limited), Mr. E. Smith (Firth-Vickers Stainless Steels, Limited), Mr. M. M. Hallett (Sheepbridge Engineering, Limited) and Mr. C. Hand (Sheepbridge Steel Castings, Limited), Dr. J. W. Jenkin (Tube Investments (Research), Limited), Mr. J. F. Lancaster (A.P.V. Company, Limited), Mr. F. H. Keating and Mr. W. D. Clarke (I.C.I., Limited, Billingham Division), Mr. G. A. Dummett (A.P.V. Company, Limited), and Dr. E. H. T. Hoblyn (director, British Chemical Plant Manufacturers' Association).

Midlands Employment

Approximately 1,440 workers in the ironfounding and motor-vehicle industries of Birmingham and Coventry lost their jobs between December and the end of January, it was reported to the Midland Regional Board for Industry on March 18. In the Midland region as a whole for the period January 14 to February 11, unemployment fell from 12,998 to 12,584, figures for these dates being Birmingham 4,370; Coventry, 1,360; Wolverhampton and the Black Country, 2,450. With regard to underemployment, Mr. W. E. Davis, Regional Controller of the Ministry of Labour, stated that information dated March 8 showed that 14,894 persons were working short time, mainly owing to steel shortage. They were losing from three hours to one day's work a week.

Calendars Received. The Eyre Smelting Company, Limited, Tandem Works, Merton Abbey, London, S.W.19, have sent us a calendar published as a souvenir of their jubilee, carrying exquisite pictures of Surrey. Metropolitan-Vickers, Limited, of Trafford Park, have included us amongst the recipients of their "Girl" calendar. Our thanks are due to both these companies.

Speroidal-graphite Iron Up to Date*

By W. W. Braidwood

An attempt to survey the progress of the development of spheroidal-graphite (or S.G.) iron to date, to assess the position now reached, and to forecast its future.

Nomenclature

Graphite.—Since the situation with regard to nomenclature of spheroidal-graphite iron is still rather confused, it may be well briefly to discuss it at the outset. It is normal to concede some right of priority in this matter and the name used by Morrogh and Williams[1] to describe the form of graphite produced by them in cast irons treated with cerium would have had universal support but for the fact that the chosen adjective, " nodular," had already for a long time been used to designate quite different types of graphite from that of the iron now referred to. Outstandingly, this term had been employed to describe the flake-aggregate form of graphite found in blackheart malleable cast iron (Fig. 1); it had also been used in some instances to describe shortened-flake graphite similar to type D of the American Society for Testing Materials classification (Fig. 2). The effect of this ambiguity is clearly shown in the exchange of letters between Moisley and Morrogh,[2] in which the former suggested that because J. E. Johnson used the term " nodular " in 1918, he must have been first in this field. Actually, Johnson was describing a shortened-flake form of graphite present in irons of very moderate properties and he made the same use of " nodular " at least as early as 1912, in his Paper, " Effect of High Carbon on the Quality of Charcoal-iron."[3] Similar confusion of the term " nodular " is revealed in the Smalley-Morrogh correspondence.[4]

At the time when Morrogh and his co-workers published their first reports, research metallurgists of the International Nickel Company were engaged in perfecting their own invention. They had realized from the start that the product of the new processes (Fig. 3) should be given an accurately descriptive name, quite free from ambiguity, and applied the term " spheroidal," which means " approximately spherical," or " approaching in shape to a sphere." This correctly describes the form of the graphite as indicated by its distinctive outline seen in polished sections viewed under the microscope. That is the simple explanation of the use, in recent years, of the two terms " nodular " and " spheroidal " to describe the same type of graphite newly-developed in "as-cast " irons. For the reasons given, the originators of the magnesium process for producing this material will continue to use the name, which they regard as correct and finite.

Material.—It is always difficult to devise a fully-suitable name for a new product. Ideally, it should be descriptive, easy to write and say, pleasant to hear, not previously used for any other product, and with no prior or alternative meanings. It is, of course, the graphite and not the iron which is " nodular " or " spheroidal." Descriptions of the material in terms such as " nodular cast iron," " nodular iron " or " spheroidal iron " are therefore loose and incorrect. The term " ductile iron " has gained fairly wide acceptance in America, where, due to the characteristics of the ores in use, it is easy to produce low-manganese irons which, after treatment with magnesium, normally exhibit appreciable elongation in

* Paper presented to the Scottish branch of the Institute of British Foundrymen. The Author is attached to the development and research department of the Mond Nickel Company.

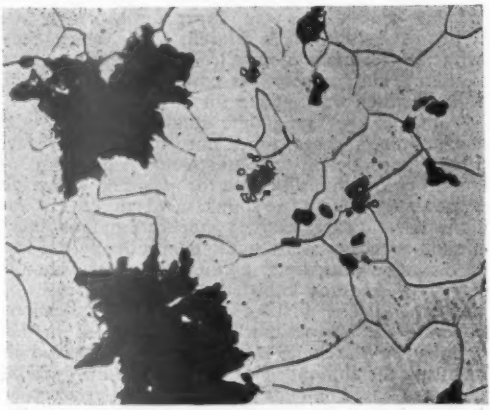


FIG. 1.—*Flake-aggregate Form of Graphite found in Blackheart Malleable Cast Iron. Unetched* × 500.

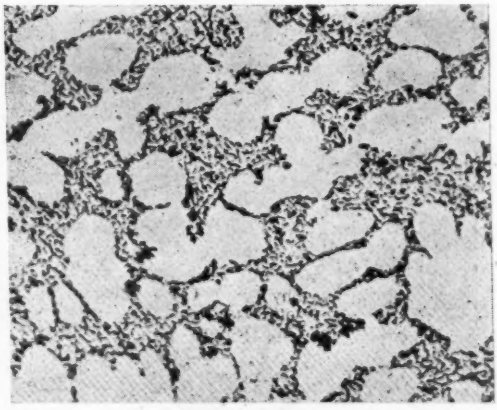


FIG. 2.—*Shortened-flake Graphite, type D of the A.S.T.M. Classification.*

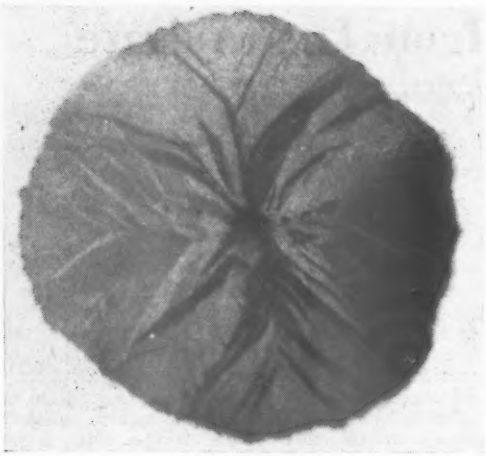


FIG. 3.—*Graphite Spheroid. Unetched* ×c1,000.

the as-cast condition. In Europe, however, manganese contents are relatively high, and the as-cast material may consequently exhibit as little as 1 per cent. elongation. In such instances the adjective "ductile" can fairly be applied only to the annealed iron.

There is the further objection that, for some purposes, the product is required to be in the hard, non-ductile condition. For these reasons, a title descriptive of the characteristic graphite structure, rather than of any single property, is to be preferred. The full name built up on this basis, *i.e.*, "spheroidal-graphite cast iron," is cumbersome. It can, however, be shortened to "S.G. cast iron," "S.G.C.I.," or permissibly, the Author submits, to the short and simple term, "S.G. iron," in which the presence of the letter "G," representing graphite, renders superfluous the adjective "cast." This term will be used throughout the present Paper and should be understood

FIG. 4.—*Structure of Typical Flake-graphite Cast Iron. Unetched* ×100.

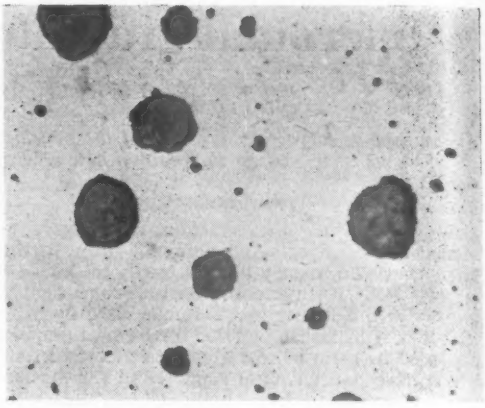


FIG. 5.—*Structure of Typical S.G. Iron. Unetched* ×100.

therein to mean iron containing graphite in spheroidal form, produced by introduction of magnesium, cerium, or other suitable elements, singly or in combination. Universal use of this name would be an immense aid to definition and convenience.

Invention

As one who lays no claim to the rôle of inventor, but who has been privileged to have intimate connection with much of the early and subsequent work, the Author has been surprised by some of the statements made in this connection. It is, of course, a very human failing to be wise after the event and few of us lack the quality best described as "hindsight." It should therefore be stated categorically that the first intimation of any process for controlled production of spheroidal graphite in as-cast iron was made in the presidential address to the British Cast Iron Research Association, at their meeting on December 11, 1946, and that the first description of this process was the Paper by Morrogh and Williams[1] published in March, 1948, which dealt with the treatment of cast irons by introduction of cerium. This process was covered by patents, the first of which was applied for in July, 1946.

Although the first public announcements of the magnesium process were not made until May, 1948,[5 6] production-scale treatments had been conducted before that time, and the invention was made some time earlier. The simple fact is that the inventions covering, respectively, the cerium and magnesium processes were made independently, by two teams of investigators, neither of which, until a late stage, had any knowledge of the discoveries of the other. The first of the Patent applications covering the magnesium process was filed in this country in March, 1947, and anyone interested in assessing the amount of work on which the application was based should study in detail the accepted British Patent Specification No. 630,070 and the equivalent U.S. Patent No. 2,485,760. These lengthy documents contain a wealth of information and

FIG. 6.—*Microstructure of Austenitic, Flake-graphite Iron near to the Fracture in a Tensile Test-piece, showing Cracks between the Graphite Flakes (Kraft and Flinn). Etched* ×*c*500.

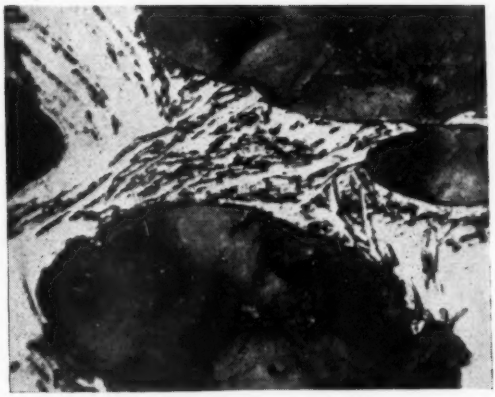


FIG. 7.—*Microstructure of Austenitic, S.G. Iron, near to Fracture in a Tensile Test-piece, showing Slip Lines and Transformation associated with Elongated Spheroids (Kraft and Flinn). Etched* ×*c*500.

data, accumulation of which obviously involved much intensive research over a long period.

Lack of Explanation

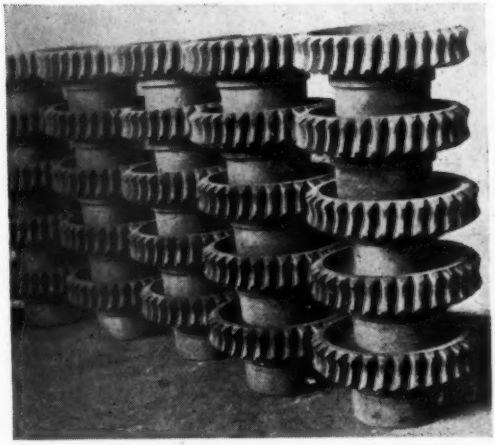
From the time of the announcements of the invention of the cerium and magnesium processes there has been such activity in research and investigation on the subject of the new-type iron as must surely never before have been known in the field of foundry metallurgy. Ideas have been plentiful, and theories based more on enthusiasm than on well-tested fact have not been lacking. Many Patent applications have been filed, and papers and articles varying widely in value and reliability have flowed from all parts of the world. Use has been made of elements other than cerium and magnesium, and of combinations of spheroidizing elements, with varying degrees of success, but from all this interplay of ideas and experience the main fact which has emerged to date is that the introduction of magnesium so as to leave a small but significant residual content is the most practical basis for production of spheroidal graphite in cast iron. Although the mechanism of formation of spheroidal graphite has been studied by many individuals and organizations, no theory yet evolved fits all of the observed facts. Fundamental work done in the laboratory of the Mond Nickel Company is to be described later this year in a Paper to the annual conference of the Institute of British Foundrymen.

Patents

The Patent position is now becoming much clearer. Letters Patent covering the treatment of hyper-eutectic irons by introduction of cerium have been granted to the B.C.I.R.A. in the U.K. and many other countries. Letters Patent covering the treatment of hyper- and hypo-eutectic irons by introduction of magnesium have been granted to the International Nickel Company in the U.S.A. and Canada, and to the Mond Nickel Company in Belgium, France, India, Italy, Luxembourg, South Africa, Spain, Switzerland and several other countries. These major Patents are likely to dominate the S.G.-iron field.

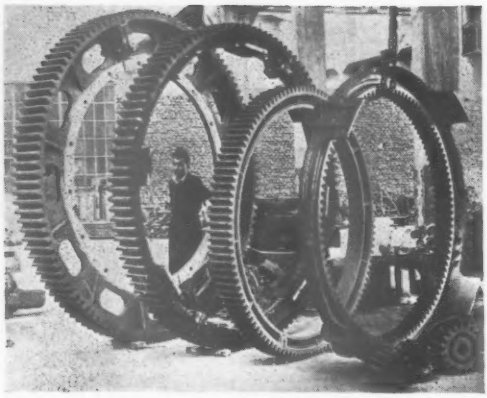
There is, of course, much scope for further invention, relative to meritorious improvements in technique, such as addition-alloy compositions of special types, novel methods of introducing the spheroidizing elements, etc. There is scope also for Patents covering the use of completely new spheroidizing agents or combinations of these, but, although other elements are known to exercise spheroidizing effects of varying potency, it seems unlikely that there is a thoroughly practical future for any of them.

It may be helpful to make clear at this stage that



[*Courtesy Société Belge Griffin, S.A., Belgium.*

FIG. 8.—*Group of Worm Gear Wheels, As-cast.*



[*Courtesy Fonderia G. Tagliabue, Italy.*

FIG. 9.—*Group of Girth Gear Wheels and Pinions.*

the process involving the use of magnesium, often referred to as "the magnesium process," is not, as has sometimes been stated, "the nickel-magnesium process." It is certainly the case that nickel-base alloys give excellent results and that their use represents the most practical procedure at the present time. Nevertheless, the Patents cover the introduction of magnesium in any form to leave a residual magnesium content of small but significant amount productive of the spheroidal form of graphite, as-cast or after heat-treatment.

FIG. 10 (BELOW)—*Machined Crankshaft for Compressor.*
[*Courtesy Jernstoberiet Dania A/S., Denmark.*

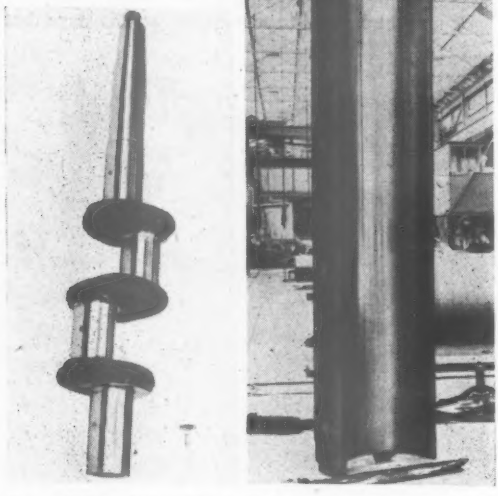


FIG. 11.—*Bed for Single-roll Steam-jacketed Laundry Ironing Machine; Cast by Robert Taylor & Company, Larbert, for D. & J. Tullis, Limited.*

Properties

From study of the microstructure of a typical, flake-graphite iron, as shown in Fig. 4, it is easy to appreciate the markedly adverse effect on the properties of the metallic matrix exerted by the presence of the graphite in long, thin, sharp-ended, and often inter-connecting flakes. It is equally easy to understand how modification of the same proportion of graphite to the form of compact, well-dispersed spheroids, as shown in Fig. 5, greatly reduces its weakening effect. The marked improvement in properties associated with such change is not surprising. Kraft and Flinn[7] have compared the properties of S.G. iron and steel of similar matrix structures and report excellent correlation: strength is decreased by only about 20 per cent. because of the presence of spheroidal graphite. Compared with flake-graphite irons with similar matrices, the S.G. irons were two to three times stronger, and their elongation was five to twenty times greater. In the same paper two photomicrographs, reproduced here as Figs. 6 and 7, illustrate the effects of flake- and of spheroidal-graphite on the properties of austenitic irons of identical composition. The specimens were cut from the tensile test-bar sections adjacent to the fractures. Fig. 6 shows clearly the cracks which have formed between the graphite flakes, while Fig. 7 shows the slip lines and transformation between the elongated spheroids in the magnesium-treated iron.

Specifications

Standard specifications have not yet been issued to cover S.G. irons. Until this lack is made good licensees of the Mond Nickel Company are complying with mutually-agreed specifications covering three grades of S.G. iron, set out in Table I.

TABLE I.—*Interim Specification for Spheroidal-Graphite Cast Iron. (Minimum Values.)*

S.G. Iron.	Pearlitic.	Pearlitic/ ferritic.	Ferritic.
Ultimate tensile strength (tons per sq. in.)	37	32	27
Yield point (tons per sq. in.) ..	27	24	20
Elongation (per cent.)	1	5	10

All as determined on 1-in. thick keel-block test-bars.

The American Society for Testing Materials has reached the stage of recommending a tentative schedule[8] for S.G. irons. The Society proposes that, for the present, only the pearlitic and the ferritic grades should be covered, and it is gratifying to note that the minimum properties specified for these are almost identical with those earlier agreed by Mond licensees for the same types of S.G. iron.

It will be noted that S.G. irons exhibit notably higher ferritic yield strength than conventional blackheart malleable cast irons. This is something not universally appreciated, and indeed some of the illustrations widely used in literature on the subject, such as twisted bars, may have given the impression that S.G. irons are readily deformed. This

is certainly not the case: they resist plastic deformation up to high stress values, though they possess the ability subsequently to deform.

Heat-treatment

S.G. iron responds fully to conventional heat-treatments, including flame- and induction-hardening. Maximum hardness developed by quenching is of the order of 600 Brinell, and oil-quenched and tempered S.G. irons have quite remarkable combinations of properties. Rehder[9] has provided a useful chart showing the effect of tempering temperature on the mechanical properties of quenched unalloyed S.G. iron. This shows combinations ranging from 63 tons per sq. in. ultimate strength with 4 per cent. elongation at 290 Brinell on tempering at 540 deg. C., to 31 tons per sq. in. with 18 per cent. elongation at 153 Brinell on tempering at 730 deg. C. As would be expected, even better combinations of properties are obtained in alloyed S.G. irons, quenched and tempered, or isothermally transformed.

In Europe, most of the castings, other than those of heavy section, are annealed. As the temperatures involved are not excessive and the times of exposure are comparatively short, it is normally unnecessary to make arrangements for protection of the castings from oxidation. Nevertheless, it is an advantage if conditions within the furnace are kept as reducing as possible.

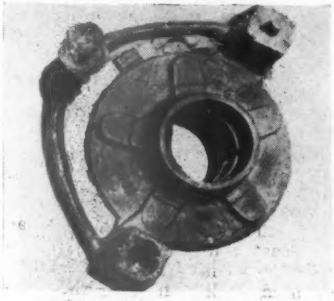
The versatility which stems from ready response to the various forms of heat-treatment is exemplified in the article by Sheley.[10] This reports the experience of the Black-Clawson Company, who are regularly producing in S.G. iron castings which range from less than 1 lb. to more than 7½ tons in weight. In the as-cast condition the iron exhibits yield strength of 31 to 38 tons per sq. in., and ultimate strength of 43 to 51 tons per sq. in., associated with elongation of 10 to 4 per cent. and hardness of 220 to 280 Brinell. By heat-treatment, ranging from full annealing to oil-quenching and tempering, the properties are varied from 28 tons per sq. in. tensile with 170 Brinell, to more than 45 tons per sq. in. with over 450 Brinell. In some instances the teeth of annealed gear wheels are flame-hardened. By variation in heat-treatment, five grades of S.G. iron are processed from the single as-cast material, and the products are proving to be highly satisfactory in the Black-Clawson paper-making and allied equipment.

[*Courtesy Mario Pensotti, S.p.A., Italy.*

FIG. 12.—*Ribbed Nozzle for Oil Burner, complete with Ingates.*

Hardness

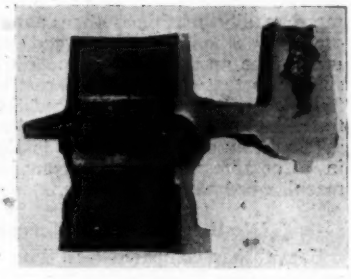
The hardness of S.G. iron is higher than that of blackheart malleable cast irons or of flake-graphite irons with the same matrix structures. This is due partly to the more compact form of the graphite. On the other hand, where comparison is made with steels, especially in the hardened condition, it must always be remembered that there is graphite present in S.G. iron, and that the true hardness of the matrix is greater than that determined by normal indentation procedures. In other words, comparison is made between the *overall* hardness of the iron and the "*matrix*" hardness of the steel. Therefore, where S.G. iron and steel have the same Brinell hardness, the matrix of the iron is actually the harder. It is probably partly for this reason, and because of the beneficial self-lubricating effect of the graphite present, that S.G. iron is showing itself to be notably resistant to wear of the metal-to-metal type, under lubricated conditions.



[*Courtesy Sveriges Mekanforbund, Sweden.*

FIG. 13 (LEFT).—*Hub Casting, complete with Gates and Feeders.*

FIG. 14 (RIGHT).—*Hub Casting, Sectioned through Feeder, showing that Shrinkage is very properly confined to the Head.*



[*Courtesy Sveriges Mekanforbund, Sweden.*

[Courtesy B. Ubbink & Co., N.V., Holland.

FIG. 15.—*Quayside Bollard, complete with Gates and Feeders.*

Gears are now a well-established and highly successful application. Figs. 8 and 9 show examples from Belgium and Italy. Excellent results are reported from crane-track wheels operating under very arduous conditions in the foundry of a British licensee. These have already outlasted the steel wheels which they replaced, and are still in good condition. In other applications involving metal-to-metal wear, such as pistons, piston-rings and cylinder-liners in heavy engines, S.G. iron is at present under test and results to date are promising.

Machinability

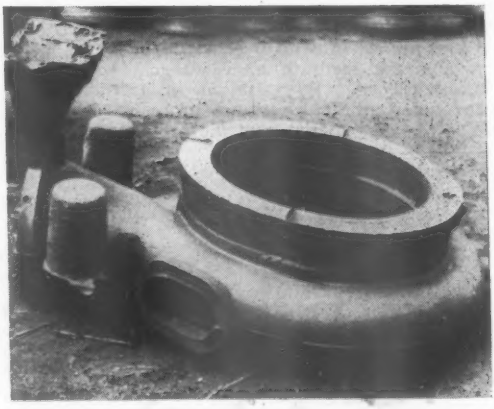
Pearlitic and ferritic S.G. irons are readily machinable. In studies of machinability made by two organizations in the U.S.A.[11, 12] S.G. irons have been compared with flake-graphite irons and cast steels. These investigations showed that S.G. irons machine more readily than flake-graphite irons of the same overall hardness and that there is little difference between the power requirements for the two types of iron. Ferritic S.G. iron was much more readily machined than annealed cast steel, especially when high feeds and low speeds were used. The machinability of pearlitic S.G. iron was similar to that of normalized cast steel. The high finish characteristic of machined S.G. iron is illustrated in Figs. 10 and 11, which show, respectively, a two-throw crankshaft made in Denmark for use in a compressor, and a steam-jacketed ironing machine bed weighing 2 tons, made in Scotland.

Resistance to High Temperature

Eagan[13] has compared S.G. iron with unalloyed and low-alloy flake-graphite iron, as-cast and heat-treated, in a series of tests involving cyclic heating and cooling. His results demonstrate that on heating to and cooling from the austenitic range, the S.G. iron showed much reduced oxide penetration and growth. Moreover, whereas the cyclic heat-treatment had a very detrimental effect on the mechanical properties of the flake-graphite irons, especially the unalloyed material, the tensile strength of the S.G. iron was actually increased, though its ductility was lowered.

White, Rice and Elsea[14] have studied the effect, on resistance to growth and scaling, of conversion of the graphite from flake to spheroidal form in irons maintained at eutectic composition and with silicon contents ranging from 2.6 to 6 per cent. The main aim of this investigation was improvement of the normal 5 to 6 per cent. silicon heat-resisting irons. As expected, the S.G. irons in the series were markedly stronger than their flake-graphite counterparts. Their impact resistance was also superior, though the margin decreased with increase in silicon, becoming negligible at the 6 per cent silicon level. The general conclusion was that, up to 5 per cent. silicon, treatment with magnesium gave marked improvement in mechanical properties and lessened the main objection to this type of iron, which was excessive brittleness. Scaling tests conducted in air at 870 deg. C. as well as growth tests showed that the S.G. irons were considerably the more resistant to both growth and scaling. The 4 and 5 per cent. silicon S.G. irons were found to exhibit a combination of mechanical properties and heat-resistance which will fit them for many industrial applications. The heat-resistance of the 6 per cent. silicon S.G. iron was outstanding.

Laboratory investigations, such as those quoted, confirm the findings already derived from tests in service, and undoubtedly there is a big field for S.G. iron for items such as furnace doors, grates, boiler parts, etc., required to resist growth and scaling at high temperatures. Fig. 12 shows a nozzle casting for an oil burner complete with its gating system.



[Courtesy B. Ubbink & Co., N.V., Holland.

FIG. 16.—*Sludge-pump Casing, complete with Gates and Feeders.*

Founding

To the inexperienced observer, magnesium-treated iron seems " dull." This is due to the contrast with the preceding bright flare of burning magnesium, and partly because a film, probably of magnesium oxide, forms on the skimmed surface, giving a " lifeless " appearance. Nevertheless, despite the addition of solid material in fair proportion, followed by inoculation, the fluidity of the treated metal is good, and a recent study by the B.C.I.R.A.[15] has shown hyper-eutectic iron to be even more fluid after than before magnesium treatment and inoculation.

The patternmakers' contraction allowance is normally similar to that required for high-grade grey irons. There is, however, more pronounced shrinkage, but this is not the hazard which it at first seems, because the greater shrinkage is evidenced much more by " piping " in the feeders and "sinks" on the external surface of insufficiently-fed sections than by internal porosity of the type liable to be found in unfed sections of flake-graphite irons. Intelligent positioning of gates and feeders confines the shrinkage cavities within the feeders, and production of sound castings is not unduly difficult.

A good illustration of the behaviour of S.G. iron in a typical mould is shown by Figs. 13 and 14. The former shows a hub casting, complete with single downgate, half-ring runner and two side feeders. The latter shows the same casting after sectioning. It will be seen that piping is concentrated entirely within the feeder and that the casting proper, although it is of non-uniform section, is completely sound throughout. Figs. 15 and 16 show two gating and feeding layouts from Holland. In the first instance, that of a quayside bollard, the finished weight (154 lb.), represents a yield of 70 per cent. The second is a sludge-pump casing. In this instance the yield was 53 per cent. and the machined casting, weighing 242 lb. was sound under pressure test. The photograph shows clearly the excellent surface of this casting.

REFERENCES.

[1] " The Production of Nodular Graphite Structures in Cast Iron," Morrogh, H., and Williams, W. J. *Jnl. Iron and Steel Inst.*, 1948, vol. 158, pp. 306-322.

[2] " Is Nodular Cast Iron New ? " *Iron and Steel*, 1948, vol. 21, pp. 470-471.

[3] " The Effect of High Carbon on the Quality of Charcoal-iron." Trans. Amer. Inst. Mining Eng., 1912, vol. 44, pp. 314-355.

[4] " Some Notes on the History of Nodular Irons." *Iron Age*, 1949, vol. 163, May 19, pp. 100-102, and June 16, p. 64 ; vol. 164, July 14, pp. 68, 72.

[5] Pfeil, L. B., Discussion on " The Production of Nodular Graphite Structures in Cast Iron " (Item 1 above). FOUNDRY TRADE JOURNAL, 1948, vol. 84. p. 463.

[6] Wickenden, T. H., Discussion on " Production of Nodular Graphite Structures in Gray Cast Irons," by H. Morrogh. Trans. Amer. Foundrymen's Soc., 1948, vol. 56, p. 88.

[7] " Interrelation of Mechanical Properties, Casting Size and Microstructure of Ductile Cast Iron," Kraft, R. W., and Flinn, R.A. Amer. Soc. Metals, Preprint No. 33, Oct., 1951 ; 25 pp.

[8] " Specifications for Nodular Iron." *Gray Iron Industry News*, 1950, July.

[9] " The Annealing and Heat-treatment of Nodular and Other Cast Irons," Rehder, J. E. *Mém. Congrès International de Fonderie*, Bruxelles, Sept., 1951, pp. 313-324.

[10] " Ductile Iron Replaces Alloy Gear Castings, Forgings," Sheley, J. D. *Iron Age*, 1951, vol. 167, May 10, pp. 99-100.

[11] " Machinability Research Program Reported," *Iron Age*, 1950, vol. 166, Nov. 9, pp. 99-102.

[12] " High Machinability and Productivity of Ductile Iron," Kahles, J. F., Zlatin, N., and Kropf., R. B. *Metal Progress*, 1951, vol. 59, pp. 238-242.

[13] " Comparative Growth of Gray Iron *v.* Nodular Iron when Cyclically Heated to 1,650 deg. F.," Eagan, T. E. *Foundry*, 1950, vol. 78, Dec., pp. 96-99, 203-204.

[14] " The Influence of Silicon Content on Mechanical and High temperature Properties of Nodular Cast Iron," White, W. H., Rice L. P., and Elsea, A. R. Amer. Foundrymen's Soc., Preprint 51-5 April, 1951 ; 9 pp.

[15] " The Fluidity of Molten Cast Iron," Evans, E. R. Brit. Cast Iron Research Assocn. Jnl. of Research and Development, 1951, vol. 4 pp. 86-139.

(*To be continued*)

One-piece *v.* Composite Pattern Construction

By " Chip "

Patterns, unlike other articles made of wood, are not ends in themselves, but are means to an end, namely, the production of high-class castings as cheaply as possible. Consequently, patterns have to be constructed to allow of easy moulding and also to withstand distortion which may occur because of the shrinkage or swelling of the timber, due to the changing atmospheric conditions of the foundry. The warping of the pattern would consequently be reflected in the resulting casting, causing it in many cases to be scrapped.

Fillets are incorporated in patterns to ensure strong castings and on many patterns they are cut from the solid timber in preference to being left to the moulder to cut in the mould. Alternatively, the patternmaker uses loose fillets of wood, leather or wax. Especially in shops possessing a wood miller is the former practice adopted and it is the opinion of the writer that sometimes the fetish of cutting fillets from the solid can result in inferior patterns from the point of view of distortion.

For example, recently, a pattern for a casting as shown in Fig. 1 was examined by the writer who was surprised to see that the base A had been cut from one piece of timber together with the fillet for part B which was subsequently mounted in position. A superior pattern would have resulted if constructed as in Fig. 2, in which the base, X, would be prepared of the required thickness and the two end-pieces placed across the opposite way of the grain as at Y. If desired, they could be recessed in the plate to allow of the fillet being cut from the timber of the part Y. The bracket part would be screwed into place and a leather or wax fillet worked around.

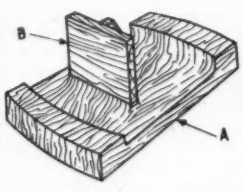


FIG. 1.—*Pattern, having the Base-piece Shaped from one Piece of Timber.*

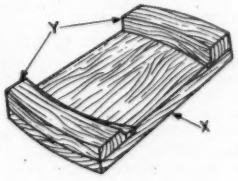


FIG. 2.—*Improved Pattern, similar to that shown in Fig.* 1, *with Shaped Pieces recessed into the Base.*

Notes from the Branches

Scottish

The annual general meeting of the Scottish branch of the Institute of British Foundrymen was held on March 8 at the Royal Technical College, Glasgow, Mr. R. R. Taylor (branch president) in the chair. He was supported by Mr. Colin Gresty, the president of the Institute, and Mr. T. Makemson, M.B.E. The honorary secretary (Mr. John Bell), in his annual report, said that membership had been virtually static at 495. The branch had during the year lost five prominent members:—Mr. J. R. Wilson; Mr. A. MacNab; Mr. John G. Bell; Mr. J. Paul; and Mr. "Roy" Brown. The average attendance at 69 had been somewhat less than in previous years. A feature in last year's programme was two joint meetings with the Institution of Mechanical Engineers held in Glasgow and Edinburgh to hear Mr. J. F. B. Jackson, B.Sc., director of the British Steel Founders' Association Research and Development Division, speak on the subject of "Steel Castings and the Engineer." The usual joint meeting with the Dundee Institute of Engineers was this year addressed by the branch president, Mr. Taylor. During the year a new section has been formed at Arbroath, where Provost Webster is the president and Mr. R. Leeks the honorary secretary. The Falkirk section has made good progress under the leadership of Mr. H. C. Stewart as president and Mr. Alex. Bulloch as honorary secretary. During the year Mr. Daniel Sharpe, a past president, was honoured by being made an honorary member of the Institute. Two members of the branch, Mr. James Currie and Mr. D. Redfern, received the Institute's Diploma for the papers they presented.

The Senior Surtees Medal was won by Mr. J. McGrandle. The Junior award was shared between Mr. R. J. Campbell and Mr. J. Q. Dickie. The second and third prizes went to Mr. A. Jackson and Mr. A. Campbell. Mr. A. Marshall was again the examiner.

The following were elected to the various offices for the next session:—As *president*, Mr. A. J. D. Black; as *senior vice-president*, Mr. J. Cameron, Jun.; as *junior vice-president*, Mr. Daniel Brown; as *members of council*: Mr. A. S. H. Sawers; Mr. M. M. Stubbs; and Mr. Wm. Thompson; *representatives to the General Council*, Mr. J. Cameron, Jun.; Mr. J. Cormack; Mr. Tom Shanks; and Mr. R. R. Taylor; as *representative of the Technical Council*, Mr. James McPheat; *honorary secretary*, Mr. John Bell.

Thereafter, Mr. Gresty addressed the meeting and congratulated the branch on the highly satisfactory condition in which it stood today. Then Mr. John Hunter, leader of the operational research team of the British Cast Iron Research Association, read a Paper on "Ways and Means of Increasing Productivity."

In the evening, the annual branch dinner was held at the Grosvenor Restaurant. The toast of the "City of Glasgow" was proposed by Mr. John Bell and Bailie A. Donald, M.A., replied. Sir John Duncanson proposed "The Institute," the reply being given by the president, Mr. Colin Gresty. Of major interest was the toast to "The Secretary" (Mr. Tom Makemson), for with it went a presentation of a series of gramophone records, and container, including several records of a Scottish character as a souvenir of 25 years of sterling work for the Institute and for the Scottish branch. Mr. Taylor, the branch president, called for the toast and made the presentation. The final speeches were made by Dr. H. T. Angus and Mr. Taylor as proposer and respondent to the toast of "The Scottish branch."

Old Glasgow Foundry Sold

After being in the hands of one family for over a century, the Glasgow firm of Shaw & McInnes, Limited, cast-iron pipe founders, Firhill, has been sold. Col. A. D. McInnes Shaw, former M.P. for West Renfrewshire, who, with his mother, was owner of the business, told our correspondent that the business had been bought outright by the Furness Shipbuilding Company, of Haverton Hill-on-Tees.

Firhill Ironworks were founded in 1846 by two brothers—John and James Shaw—and in 1851, the name was changed to Shaw & McInnes when Col. Shaw's father, the late Sir Arch. McInnes Shaw, joined the firm. Col. Shaw said that so far as he was aware there would be no change of policy introduced by the new owners, and that the majority of the employees were being retained. The firm, which manufactures pipe and pipe-fittings, built up a connection with shipbuilding in the "boom" period on the Clyde before the first world war, when they opened a foundry at Scotstoun, Glasgow, to handle work for the yards. This factory was closed a number of years ago. About 250 people are employed by the firm. Mr. Lightbody, at present with the company, is to be one of the directors when the change is effected. Incidentally, an interest in the Furness Shipbuilding Company was acquired last year by a London financial group.

Student's Grant, 1952

For the past three years, part of the funds that have been made available by the Joint Iron Council to the Institute of British Foundrymen for technical and educational development purposes has been utilized to assist promising young men in the industry with their studies, and a further grant has been made to enable a course to be taken at the National Foundry College during the session 1952-53. Any foundrymen or students who desire to be considered for this award are invited to make a formal application to the secretary of the Institute. Full particulars should be given by each applicant, including name, age, address, present employer, chronological account of previous experience and similar details as to technical studies. It will be the endeavour of the Institute to secure the co-operation of the selected candidate's employers to ensure him continuity of employment. Applications should be sent as soon as possible, and in any event not later than May 1.

Association Technique de Fonderie

The 25th Congress of the French foundry technical association is to be held in Lille from May 19 to 21 next. The provisional programme announced is as follows:—Monday, May 19: morning, registration and opening speeches; afternoon, technical session. Tuesday, May 20: morning, technical session; afternoon, works visits; evening at 8 p.m., Congress dinner. Wednesday, May 21: morning, technical session; afternoon, works visits. The British Exchange Paper is being presented by Mr. Harbach and Mr. Pentz on "Synthetic-resin Corebinders."

REFRACTORY MOULDINGS & CASTINGS LIMITED, of 10, Market Place, Kegworth, Nr. Derby, announce that their telephone number and telegraphic address are now Kegworth 429 and Aremcee, Kegworth, respectively.

Further Mechanical Aids for the Foundry*

By A. S. Beech, M.I.Mech.E.

(*Continued from page* 283)

JOBBING FOUNDRIES

Medium Foundry

Many foundrymen throughout the world still adhere to the theory that mechanization methods can be applied only when the demand is for large numbers of castings off any given pattern, and they praise the efforts and results obtained in the production of repetition castings, but they still maintain that the jobbing side cannot be mechanized. As a result, the jobbing shop, except in a few instances, lags behind. Certainly, mechanization or semi-mechanization of the jobbing shop is a much more difficult problem to solve, and will probably never be solved to the same extent as in the repetition shop, but a great deal can be done to lessen the laborious work in such shops which has been the rule in the past.

Fig. 7 indicates the layout for the manufacture of medium castings, ranging in weight from 1 to 12 cwt., all of a jobbing nature. It gives a very good general idea of what can be done to overcome the present world shortage of skilled moulders, and also to make foundries attractive to both the older and the younger generation.

If it is possible to cut out the "donkey" work by the use of electric power, and, at the same time, leave the skill, such as pattern drawing, gating, patching, etc., to the individual moulder, and make his surroundings more congenial, youths, who are so badly needed in the foundries, will be attracted, and the output per man employed will advance rapidly. Within six months of the installation of three mechanized plants at a works, twenty-five applications were received from youths for training. Previous to this there had not been one application for eighteen months.

The five jolt machines shown in Fig. 7 were already in the foundry before the other part of the installation was considered, and will probably be replaced by automatic mechanical sand-ramming machines. One such sand rammer is already installed on the mechanical moulding side of the unit, and is much more elastic in its application than the jolting machines.

At the present time, however, the moulds are rammed up on the jolt machines and by the sand rammer, and are transferred to the sand bed

* Abstract of a Paper presented to the Institution of Mechanical Engineers. The Author is chairman and managing director, Foundry Equipment, Limited.

FIG. 7.—*Mechanized Foundry for Medium-weight Castings Production. One Sand Rammer and Five Jolt Machines are installed, and Closing and Casting are carried out on the Floor.*

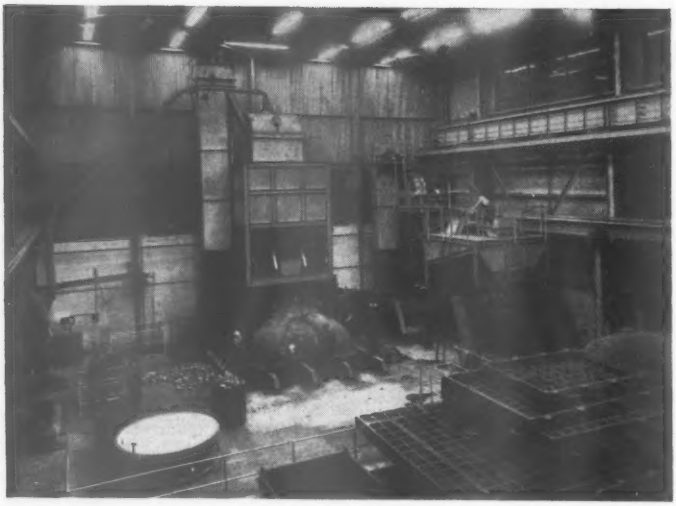


FIG. 8.—*General View of the Knock-out and Sand-treatment Plant. Dust Extraction from the Knock-out is by Suction from Below.*

casting points by means of the overhead crane. After pouring, and after the castings reach solidification, the moulds are knocked out in the vicinity of the knocking-out grid, and the sand then passes through the plant and eventually arrives in a re-prepared condition at the hoppers situated over the moulding machines, for use once more.

All castings made on this plant are cast in green sand. If, however, dried sand moulds had to be used, portable mould dryers or stoves would be necessary and the layout would be completely different. For such layouts as these, overhead cranes or mechanical lifting appliances are absolutely essential, as these are the only practical methods of transporting heavy moulds and castings of varying dimensions.

Heavy Foundry

The castings made in this foundry (Fig. 8) range in weight from 1 to 35 tons each. Some of the moulds are made of brick and loam, but in the main they are made of dried sand, are very heavily cored, and of a very intricate nature. All this sand has to be reconditioned, and as it includes large, hard lumps which have to be broken down before reconditioning, a special type of sand breaker has been installed.

There is a very large stationary knocking-out grid to deal with sand from the largest boxes. The other items in this plant are the magnetic separator, hexagonal rotary screen, 50-ton storage hopper, 15-tons-per-hr. continuous sand mill, distintegrator, and two 10-ton hoppers, from which finished sand in good moulding condition can be drawn. In addition there is a new sand hopper with a capacity of 10 tons, with all the necessary sand-feed belts, elevators, etc. The ramming up of these very large moulds is carried out mainly by the use of a tractor type of Sandslinger of American design. The installation is served by powerful overhead cranes, and the entire plant gives complete satisfaction.

Sand Crusher

This machine (Fig. 9) is composed of an outside stationary cylinder, with a chute, into which the sand is introduced. Inside this cylinder is fitted a main shaft on to which are bolted a number of retaining discs, whose main function is to keep the loose crushing ball between each disc from travelling laterally.

The sand is introduced into the chute and as the discs rotate on the shaft the sand, in a lumpy condition, is directed forward to come into contact with the crushing balls, which reduce the lumps to grain size. The sand therefore travels forward, and is evacuated at the end of the drum, whence it is reintroduced into the sand system.

Mechanical Sand Rammer

The type of machine shown in Fig. 10 is the British counterpart of a type that originated in the United States, and differs fundamentally and in details from it. The official name of the United States machine is the Sandslinger, whereas the British machine is called the sand rammer. One of the many points of difference is that it is believed in Great Britain that the machine should not be portable, but stationary, unless the portable machine possesses its own hopper or bunker from which it can obtain a supply of well prepared and conditioned moulding sand. Further, all foundries making fairly large castings, suitable for moulding with this machine, must possess overhead cranes, and, consequently, it is probably easier to take the job to the machine, than the machine to the job.

FIG. 9.—*Sand Crusher (External View) Installed in a Heavy Foundry; Internally, Crusher Balls Run on the Circumference, but are Retained by Discs mounted on the Central Shaft.*

Moreover, the machine operates at such a speed that it has been found, from actual experience, that in order to obtain a uniformly rammed mould, it is essential to have a regular and continuous flow of sand to the head of the machine, and that this sand must be free of all "foreign" matter, particularly metallic inclusions. When the provisions possible in the portable machine are not present, a large packet of sand is fed into the head of the machine and is rammed into the mould, then for a few moments very little or no sand arrives, during which time the impeller is thrashing air, until a further supply of sand arrives. Such conditions result in unevenly rammed moulds.

Apart from this, there is always a danger when taking a supply of sand from the foundry floor that a runner or git or some other piece of metal will be included in the sand, and as this will without doubt get into the impeller head. The result would probably be that some vital part of the machine would be smashed, and quite possibly the operator might be injured. The sand rammer or Sandslinger is the only machine at present on the market which can successfully deal with jobbing work, or large castings which are too big for the average moulding machine.

Throughout the world hand moulders are scarce, and, consequently, wages are high. Apart from that aspect, however, the highly skilled man should not be used for the hard donkey work of shovelling sand into a moulding box, and the long and tedious work of ramming up large moulds. The skill of the hand moulder should be used to draw the pattern, or to do any patching to the mould, which is inevitable when a wooden pattern is used, as is usual in jobbing work.

The skilled man should also supervise the core-setting and closing of the moulds, and generally finish the moulds ready for pouring. The machine should be left in the hands of an unskilled or semi-skilled man, who has only to guide the head over the box to solidly ram up the mould.

Thus, apart from the fact that this type of machine is a great time saver, it also is a great labour saver, and frees the skilled moulder for a much more important section of moulding, where his skill can be displayed to the utmost. It is so elastic that it is absolutely indispensable in any jobbing foundry or for special work, such as for standard items of large size castings.

Experiments made by the Author incorporating a number of flat blades showed a great improvement in the regularity of ramming was obtained, in fact, with the plural blades the ramming is quite uniform. It is also found possible to deal with a much larger quantity of sand with this machine than with the one with a single cup, and thus the capacity is greatly increased, without increasing the dimensions of the actual head.

With the multiple-bladed type of sand rammer (Fig. 11), the wear is very much less on both the blades and the liners and, as wear takes place on the blades, all that is necessary is to undo the screws, regrind the top of the blades, and replace them. The blades, which are made from ordinary mild steel, last for from two to three months, and the liners, which are made from high-tensile steel, last for about five to six weeks.

The impeller drum in Fig. 11 has only two ramming blades, but the patent application covers a plurality of blades, as may be found necessary for larger sizes of head.

For the repetition moulding of tractor frames and gearboxes, the size of the boxes are approximately 5 ft. by 3 ft. by 10 in. deep, and the production obtained is ninety complete moulds in 8 hr. Fig. 12 shows a sand rammer installed in large motor works. The pattern drawing is carried out by a pneumatic type of roll-over machine.

Rammer for Small Works

The small foundry had not been catered for up to the present time. Small foundries all over the world have had to make their living by making one or two castings off comparatively small patterns. Their only solution is to ram up such moulds by hand. With a new size and type of sand rammer small foundries will be able to utilize a mechanical ramming agent, and even for larger quantities of varying patterns, this machine can put them in a very good position to compete with the larger and better equipped foundry. The machine has only just passed the design stage.

This type of machine must be fed with a

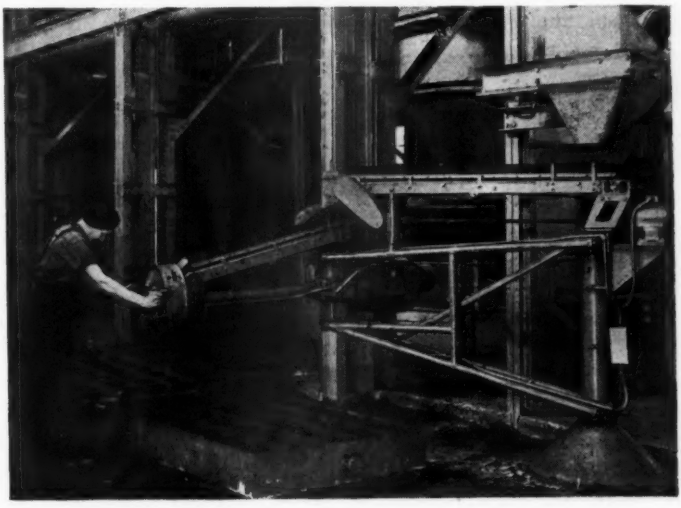


FIG. 10.—*Mechanical Sand Rammer shown at Work filling a Top Box-part. Mechanized Sand Supply is Arranged.*

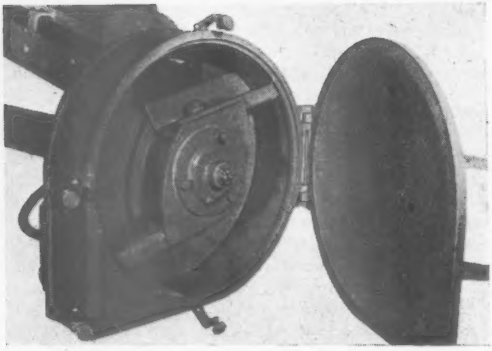


FIG. 11.—*Internal View of the Throwing Wheel of the Sand Rammer.*

continuous and regular supply of well-conditioned and clean moulding sand to procure the best results; part of it therefore comprises a feeding hopper, containing approximately four hundredweight of sand. The belts are controlled by push buttons from the head of the machine, and, as the top belt is situated directly under the top hopper, as soon as it starts to rotate, a predetermined quantity of sand is fed down on to the lower belt, and this in turn feeds into the head of the machine, which is fitted with a multiple-blade type of impeller to fling the sand at high velocity into the moulding box, thus ramming the sand securely and evenly around the pattern.

The ramming arm swivels round at approximately 200 deg., and has also a backward and forward travel of 2 ft. 6 in., so that it can deal with all sizes of moulding box up to approximately 36 by 24 in.

This machine has a very interesting field in regard to cores; for very small cores probably the core blower is the most useful machine, provided that there are sufficient cores to be made of the same design and type, but the use of the core blower demands that core boxes must be specially constructed, and hence the core blower is only useful for core making when large repetition quantities are needed. The minor sand rammer, on the other hand, does not need special core boxes, and, consequently, it can ram up all cores up to 36 by 24 in., whether for jobbing or repetition work. The minor rammer also shows great advantage over the core blower for large-size cores, for either jobbing or repetition work.

Mechanized Jobbing Shop

Fig. 13 shows to what extent mechanization can be carried out in a jobbing foundry. The work to be made in this foundry consists entirely of jobbing work, ranging from 1 lb. up to 2¾ tons in weight. Some of the castings have to be made in green sand, and quite a number of the larger ones in dry sand. There are, therefore, three problems: small green-sand work, medium green-sand work, and heavy dry-sand work. Each of these requires a different type of sand, and, consequently, three sand plants are installed. In the small green sand bay, a minor sand rammer, running on a track, is installed, and is fed from the batch sand mill and plant. This machine goes up and down the track, ramming up moulds on either side of the track, and returning to the inclined belt feeder on the sand plant each time it needs a further supply of sand.

The medium green-sand moulds are made by the three "Linslade" sand rammers in the long green sand bay, and the sand is knocked out over the grids, after the moulds are cast, and returned to the plant for reconditioning and resupply to the various sand rammers at the moulding stations.

The dry-sand work is moulded up by the two "Linslade" sand rammers, one of which is fitted with a 10-ft. arm, and the other with a 15-ft. arm, for very large work. After moulding, the moulds are transferred to the drying stoves, and the dried moulds are then brought back to the pouring floor, for coring up, closing and pouring. They are then again knocked out over the grids indicated, and the sand travels back to its own special plant for reconditioning and eventual return to the sand rammers for re-use. No moulds are rammed by hand, and all the arduous and heavy work hitherto carried out by hand is entirely cut out.

Overhead cranes deal with the transportation of moulds, moulding boxes, metal, etc. The cores are rammed up by the minor sand rammer, and are then placed in the stoves for drying. The metal is melted in three cupolas, each with a capacity of

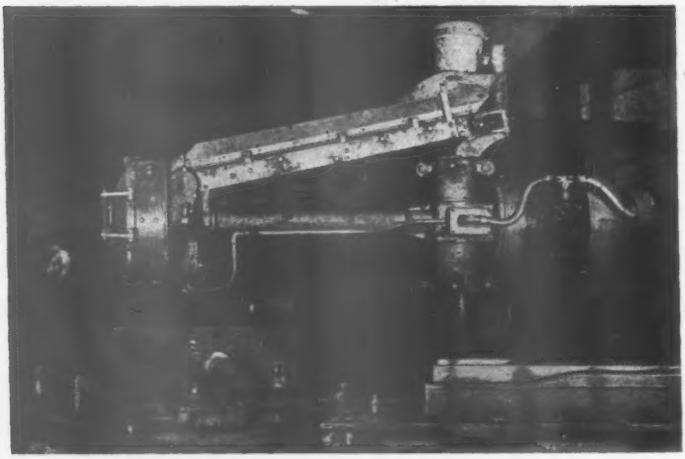


FIG. 12.—*Sand Rammer installed in a Large Automobile Foundry.*

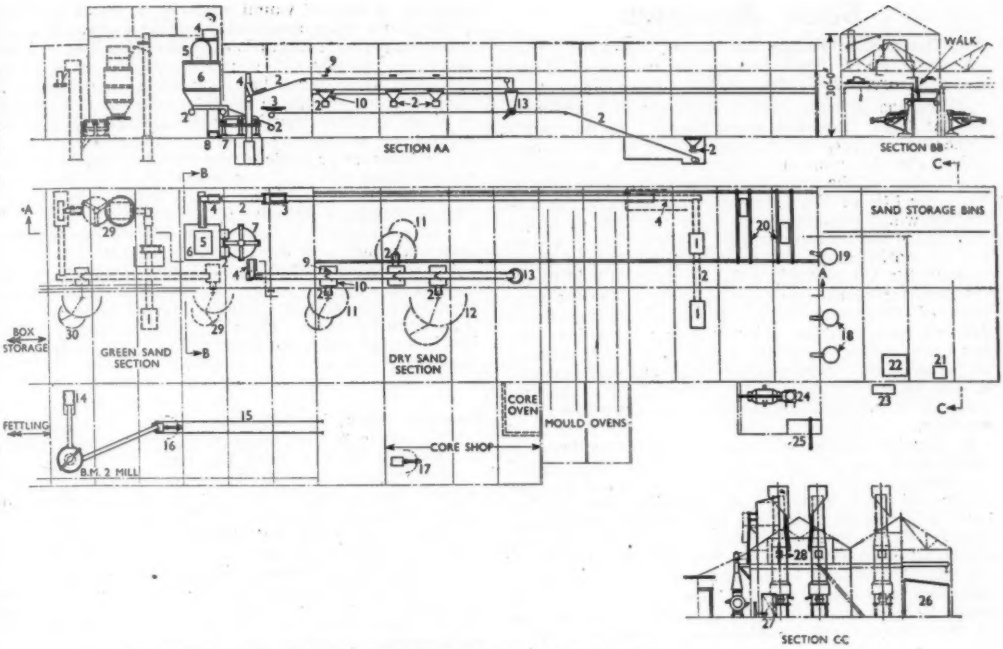


FIG. 13.—*Layout of Completely-mechanized Jobbing Foundry.*

1. Knocking-out grid and chute.
2. Belt.
3. Magnetic separator.
4. 16-inch elevator.
5. Rotary screen.
6. 50-ton hopper.
7. Sand bin mill, disk feed.
8. Chute under base.
9. Vee plough.
10. 3-ton hopper.
11. Automatic sand rammer, 10-foot arm.
12. Automatic sand rammer, 15-foot arm.
13. Conical hopper and gate.
14. Vibratory screen.
15. Rails.
16. Minor sand rammer (mobile).
17. Minor sand rammer (stationary).
18. Existing cupolas.
19. New cupola.
20. New cranes.
21. Weighing machine.
22. Lift.
23. Platform.
24. Rotary furnace.
25. Coal-dust platform.
26. Sand bins.
27. Lift entry.
28. Lift exit.
29. Existing plant.
30. New rammer.

3 tons of metal per hour, and a pulverized-fuel rotating-furnace is installed for the supply of any special mixtures of metal.

Acknowledgments

The author wishes to thank the Chief Mechanical Engineer, Mr. H. G. Ivatt, of the British Railways, Derby, and Sir Claude Gibb of C. A. Parsons and Company, Limited, for their kindness and courtesy in permitting him to use illustrations of their foundries.

Engineering Exports

Where engineering exporters had not the capacity available to give delivery of orders from overseas customers at the right time, there was a chance for a further extension of the kind of sub-contracting now common with large defence contracts, said Mr. A. R. W. Low, Parliamentary Secretary to the Ministry of Supply, speaking at the dinner of the Manchester branch of the Institute of Export. This would need more steel for export, he said, but it should not be assumed that more steel could not be diverted from production for home consumption.

The Government was asking many firms to increase their exports despite a reduced supply of steel, and this was not inconsistent if home consumption was reduced.

"We shall ask firms which receive increased allocations of steel in the second half of the year further to increase their exports by that amount," he said.

Physical Society Exhibition, April 3 to 8

At Stand No. 99 the British Iron and Steel Research Association will show four instruments at the Physical Society Exhibition.

(1) *An Electrical Micromanometer* to measure small differential pressures, from 0.001 in. water gauge upwards, particularly in Pitôt tube measurements; (2) *An Automatic Recorder for Use with a Geiger Counter Spectrometer,* built for work on X-ray fluorescent analysis; (3) *A Quick-acting, Direct-reading Chemical Balance* developed to speed up weighing operations in routine chemical analysis, especially where the analysis requires a particular weight of sample; and (4) *"Barber" High-precision Disappearing-filament Optical Pyrometer.* To achieve greater precision than that of most disappearing filament pyrometers while remaining portable and self-contained this instrument has been developed from a National Physical Laboratory design.

Book Reviews

Non-Destructive Testing of Metals, by R. F. Hanstock, Ph.D. Published by the Institute of Metals, 4, Grosvenor Gardens, S.W.1. Price 21s.

There has perhaps been a tendency in recent years for the term "non-destructive testing" to be applied rather restrictively to testing methods having as their object the detection of defects. Such a limited interpretation of the term is not, however, to be inferred from the title of Dr. Hanstock's monograph, the content of which embraces both those methods of testing applied for the measurement of physical state or chemical composition as well as those used for the detection of internal or surface flaws. Thus, 10 of the 14 chapters are devoted to such subjects as the measurement of thickness, the evaluation of surface finish, dynamic tests, damping capacity, X-ray diffraction, electrical and magnetic testing as well as to such methods of analysis as spectrography and auto-radiography. Radiography, ultrasonic testing and the various methods of surface-crack detection are given one chapter each.

It may be debated whether tests involving the preparation of special test-pieces can fairly be classified as "non-destructive," since it may be argued that the essence of such tests is their suitability for application as inspection techniques upon actual components intended for subsequent service. It is, consequently somewhat surprising to note that little short of half the text of this book is concerned with damping capacity theory and measurement, and with X-ray diffraction which techniques are generally dependent upon the use of specially-prepared test-pieces or test samples. The technique of X-ray "powder" photography for instance, when applied to the examination of metals can by no stretch of imagination be considered a non-destructive test. On the other hand, such X-ray diffraction techniques as fluorescent analysis and surface-stress analysis might fairly be classified as "non-destructive" and it is felt that the author might have been better advised to confine his attention to applications in this category. By such an approach, the two chapters devoted to X-ray diffraction might have been employed to better purpose, and at the same time done justice to this important technique.

The inclusion of three chapters on damping capacity is perhaps characteristic of the author's approach to the subject of non-destructive testing. Such well-established methods as radiography and magnetic particle inspection are somewhat briefly reviewed, more detailed attention being given to techniques which are less well known, with the object, no doubt, of presenting a work of reference from which alternative approaches to special problems may be suggested. From this point of view the inclusion of 297 literature references is a valuable feature, although in one or two instances the references quoted are either obsolescent or could otherwise have been improved upon.

The emphasis throughout this book is basic physical theory rather than the practical application of the techniques referred to. It is nevertheless surprising to find in the chapter on "radiography" that the use of artificially prepared radioactive isotopes is dismissed in one sentence and that only one literature reference to this important development is quoted. Likewise no reference is made to the recent American development known as xero-radiography.

The book is an attempt to present a concise review of a wide field of recent technological achievement. To what category of reader the book will be of value is however a little doubtful, since anyone possessing a knowledge of physics commensurate with an understanding of the text would normally be aware of works of reference more specifically related to his particular problem. This observation applies with one notable exception, namely the chapters devoted to damping capacity. These must be regarded as constituting a valuable contribution to the literature on this subject, in which to the reviewer's knowledge, there has hitherto existed no satisfactory work of reference. Mention might however be made of the literature review on this subject which was proposed in 1947 by F. C. Thompson and subsequently published by the British Non-Ferrous Metals Research Association.

The monograph is well illustrated by 60 line diagrams together with 8 half-tone blocks, the latter consisting principally of X-ray diffraction pictures. The Appendix, which attempts to summarize some of the non-destructive testing methods referred to in the text, is of doubtful value. There is both a name and a subject index, of which the latter suffers from being rather too brief.

G. M. M.

Foundry Work, by Edwin W. Doe. Published by Chapman & Hall, Limited, 37, Essex Street, Strand, London W.C.2. Price 14s. net.

In his preface to this slim volume (109 pages), the Author tells us that "this text has been prepared to teach the simple principles of foundry practice," and also that "it is hoped that this may interest some of the students to the point where they will consider some branch of the vast foundry industry as a future vocation." The reviewer considers that in both of its aims the book fulfills its purpose—it is written in plain, straightforward language, is profusely illustrated with photographs, diagrams and sketches, and the subject matter is carefully arranged so that continuity and interest are maintained throughout. The method adopted is one of first discussing the different phases of the industry in a general way, and following this with a series of examples in moulding practice, so that the knowledge absorbed by the student may be further enhanced by practical application, this assisting in quickening the student's interest. It is in the matter of this practical work that the reviewer offers his only criticism; he feels that Exercise 3 could have been used to better advantage in illustrating the use of an odd-side (entirely omitted from the book) by the simple expedient of raising the pattern so that the upper half projects into the cope. Remembering, however, that the Author is writing for the young engineering student in an endeavour to get him interested in foundrywork, the exercises chosen illustrate their purpose.

The first half of the book deals with fundamental foundry processes, patterns, moulding and coremaking in the manner outlined above, while the second half is devoted mainly to melting furnaces, melting operations and pouring, concluding with a short description of fettling processes. Safety in the foundry is given prominence at the end of each section and a glossary of foundry terms is included at the back. The reviewer suggests that this book could be used to very good advantage by lecturers in junior technical colleges, and, where facilities permit, by art and handicraft teachers among older scholars in day schools.

F. D. R.

CONVEYANCER FORK TRUCKS (CANADA), LIMITED, a subsidiary of Conveyancer Fork Trucks, Limited, Warrington, will be showing at the forthcoming Canadian International Trade Fair three basic models, a small battery/electric truck of 2,000 lb. at 20-in. load centre capacity, a heavy-duty battery/electric truck of 4,000 lb. at 20-in. load centre capacity, and a petrol/Diesel of 6,000 lb at 20-in. load centre capacity.

Handling and Lifting—their Hazards and Prevention

By A. Taylor

Many of the accidents commonly occurring in foundries are avoidable if proper attention is paid to maintenance, methods of lifting and hoisting, and, in the major degree, education of personnel. In a Paper to an Iron and Steel Engineers' Group Symposium in London recently, this subject was dealt with at length. In the following abstract from the Paper, Mr. Taylor, who is chief safety engineer for Richard Thomas & Baldwins, Limited, makes special reference to correct slinging, the loading of chain and wire-rope slings and to safety precautions in the operation of overhead cranes.

In many cases it seems to be necessary for an accident to occur before preventive action is taken; the importance of the "near" accident as a warning, however, needs emphasis. In these notes it is intended to stress the necessity for effective supervision and care in the organization of all handling and lifting operations, and in the use of such mechanical aids as industry provides. The importance of accident prevention in relation to these operations can be clearly seen from a study of the latest published figures issued by the Chief Inspector of Factories in his Annual Report. These show approximately 200,000 "notifiable" (involving the loss of three days or more) accidents in industry during the year 1949, the latest available report. Nearly half of these, 96,024, come under the heading of lifting and handling. Of this latter number, 54,811 were due to moving goods and articles, 17,841 to use of hand tools, 17,705 to being struck by a falling body, 4,389 to powered lifting machinery, and 1,278 to other lifting machinery.

Accident Costs

There are many methods of estimating the cost of an industrial accident, but most of them are based upon the compensation paid to the injured worker and the medical expenses involved as expressed in terms of insurance premiums. This is, however, far from being the total cost. There remains that additional cost which may be termed the "hidden cost." This has been estimated by Heinrich, the American safety engineer, to be four times as great as the so-called known cost; in other words, compensation payments to the injured worker plus medical expenses together form only one-fifth of the total cost to employers, of the accidents that happen. It is not, of course, contended that the proportion of four-to-one holds good for every industrial plant, but on the whole, and on the average, it is approximately correct.

Calculations from which this four-to-one ratio was derived were based on the following factors of hidden costs:—(1) Cost of lost time to the injured person; (2) costs of the lost time by other fellow-workers who stop work—whether out of curiosity, out of sympathy, to assist the injured person, or for other reasons; (3) cost of lost time by foreman or other executives for any of the following reasons: assisting the injured workman; investigating the cause of the accident; arranging for the replacement of casualties; selecting, training, or breaking in a new workman to replace the one injured, and preparation of accident reports, etc.; (4) cost of damage to machinery, tools, property, or to material; (5) incidental costs due to interference with production and the failure to complete orders on time; (6) costs due to the loss of profit on the employee's productivity and on idle machines. This loss does not include all those points which might well receive consideration when assessing accident costs, but it does clearly outline a cycle of events which follow as a result of accidents.

Lifts and Hoists

Various Governments have been concerned with the high accident ratio connected with the use of lifting and hoisting machinery, and several sections of the Factories Act, 1937/48, were devoted to setting out in detail the requirements which must be observed. The Act places certain duties and responsibilities not only upon the employer, but also upon the employee. Section 56 of the 1937 Factories Act introduced a provision to the effect that a young person may not be employed to lift, carry, or move any load heavy enough to be likely to cause injury to him. It also empowers the Secretary of State to make special regulations as to weight lifting by any class of persons employed in a factory. The elimination of manual lifting by the substitution of mechanical methods is the most likely way to reduce the number of accidents due to this cause. The most prevalent types of injury met with here are hernia, strain, traps, crushing, abrasions, and cuts. Most of these injuries could be avoided by the application of proper lifting technique.

It may be observed from an examination of the Chief Inspector's Report that lift accidents are mainly caused by suspending-rope failure; defects in lift or hoist well enclosure and doors such as to permit people to fall down the well; persons becoming jammed between moving parts of a lift and between moving parts and fixed structures.

The chief cause of rope failure is usually inefficient maintenance rather than faulty rope manufacture. Proper attention to the well enclosure, and gate interlock, should remove all possibility of

accidents occurring as a result of these defects, while those due to persons becoming jammed can usually be avoided by proper attention to maintenance. An accident in connection with lack of such maintenance is worth quoting.

A lift which was being installed in a new building, on test was found to have the counterbalance weights too light. The lift was taken to the top of the well and left with the brakes fully applied. A man entered the well to change the weights and as soon as he had removed them with a view to the replacement by heavier ones the lift commenced to descend, the rope slipping on the stationary drum. The cage fell a distance of some 60 ft. and crushed the man. It should have been expected that such an occurrence would have taken place as soon as the weights were removed. In such cases, the cage should be securely lashed to the top beam, or, better still, suitable joists placed across the well beneath the cage on which the weight of the latter could be taken. It is as well to have slots made in the brickwork of the well to accommodate the joists for this purpose.

Slings and Slinging Practice

Crane accidents for the year 1949 totalled 3,768, of which 64 were fatal. Faulty slinging accounted for some 800, of which 13 were fatal. Actually this is a very sad reflection on the standard of supervision and safety education. Recently the author investigated an accident in a steelworks where a man was fatally injured by the slipping of a load of steel sheets. A load consisting of twenty bundles of flat steel strip, each 65 in. long, was being moved by two labourers; the actual lifting of this load was by means of an overhead electric gantry crane, the total weight of the load being 23 cwt. Two endless three-strand 1-in: sisal rope slings, each 11 ft. 3 in. long, were used. While the crane was travelling the load suddenly slipped out of the slings, and fell on a worker who was packing material nearby. In the Author's view the accident was due to using the "open" method of slinging instead of taking a "bite" on the load by passing the end of each sling around the load and near the ends, passing it through the loop formed by the other and then over the crane hook.

Chain Slings and Wire Ropes

Important points to be remembered in connection with the use of chain slings are:—(*a*) The effects of shock loading; (*b*) the variation of the safe working load which takes place in multiple-leg slings as the angle between the legs is altered. Both of these points may result in overloading. Shock loading, of course, occurs in a chain sling whenever the load speed is suddenly varied, and experiments have shown that the overload can be as much as five times the normal working load.

Steel chain which is considerably stronger than that of wrought iron is now being manufactured in compliance with B.S. 590-1949 for mild steel and B.S. 1663-1950 for the higher tensile steel chain. The 1663 standard lays down breaking loads based on the formula $40d^2$ tons (where d=nominal diameter of the chain) and allows a 33 per cent. higher safe working load than that laid down in B.S. 590. There is a wide choice of steels available which, together with suitable heat-treatment make it possible to arrange for the manufacture of a chain having properties most suited for the job in hand. Certificate of Exemption No. 1 which is issued under Section 23 (*f*) of the Act, exempts steel chain from the requirements of periodic annealing, *i.e.*, once in every fourteen months, except in the case of chains or slings of ½-in. dia. or smaller or chain used in connection with molten metal, where the requirements are every six months. It is, however, well to consider the requirements of the Act regarding inspections and heat-treatment as the minimum requirement of good practice.

Finally, in connection with the use of steel chains, the author submits the following:—(1) The safe working load of chains made to B.S. 1663-1950 should be kept the same as for wrought iron and mild steel at $6d^2$ and the increased minimum breaking load of $40d^2$ be used as an additional margin of safety. This is especially important when users have a mixture of wrought iron, mild steel, and higher-tensile steel chains, in use in the same works. It would obviously be bad practice to have two chains of the same nominal diameter, each with a different safe working load, in simultaneous use. Confusion would most certainly arise, and accidents might well occur. (2) As a safety precaution, all multiple-leg slings should be marked for the safe working load at the working angle and not for 0 deg. as in current practice. (3) The responsibility for the care, and particularly the storage, of lifting tackle not in use, should be vested in one person. A suitable store should be provided in which to keep the tackle under cover, and its issue and receipt should be controlled. (4) Bearing in mind the statement that shock loading can be up to five times the normal, great care should be taken to ensure careful slinging and lifting. (5) Chain safe working load charts as supplied by makers do not usually give figures for slings with more than two legs. There is a wide difference of opinion as to the safe working load of three- or four-leg slings. In the interests of safety it is recommended that three- and four-leg slings should have the same safe working load as double-leg slings. (6) As a general system steel chain slings should be normalized once every twelve to eighteen months depending on usage.

With regard to wire ropes, the usual everyday structure, which is fairly flexible and solid, having little stretch, is 6 by 19. For larger sizes 6 by 37 is to be preferred, but slings 6 by 24 are often used on account of their greater flexibility. As in the case of chains and chain slings, inspection should be frequent and effective. Tallies or lables used for marking the rope should be small so as to prevent foul in working, and the stamping should be easy to read. The tally must be easy to mark and to attach to the rope.

Overhead Travelling Cranes

Many accidents occur every year in connection with overhead travelling cranes. During 1949, forty-six accidents, including eight fatalities, resulted from contraventions of Section 24 (7) of the Factories Act which relates to the precautions which must be taken when men are working on the track or in places where they are liable to be struck by the crane. The crane must not be allowed to approach within 20 ft. of the workplace. It is difficult enough to enforce this sub-section owing to the weakness of the human element when there is only one crane working on the track, but when, as in many steelworks, there are a number of cranes operating on the same overhead track it is still more difficult.

In some works scotches are placed on the track at the statutory distance from the place where men are working and in addition the crane driver, or drivers, are warned. There are obvious defects in this system, especially where the cranes travel at speed. Another method is to place large red flags on or near the track and also to warn the driver. Again, in one large steelworks men sometimes have to work on or near the crane track, or on the crane itself, in positions where they are liable to be struck by a moving crane. In these circumstances red oil lamps are suspended from the track at the statutory distance on each side of the workplace, and in addition a look-out man is placed in the driver's cabin of the crane or, where there is more than one crane, in the cabin of each crane on either side of the workplace. This system is expensive in manpower, but not as expensive as accidents.

Cut-out Switches

Another way suggested is for each crane to be fitted with a ramp operating a cut-out switch, controlling the long-travel motor. Attached to each stanchion—on the appropriate side of the track—at ground level, are handles which operate suitable strikers. When operated, these strikers are raised and contact the ramp on the crane. The system here is for the appropriate ramp to be raised on each side of the workplace and the handle hooked in position. When a crane approaches the workplace, it is brought to a stop as soon as it strikes the ramp. The objection to this system is that, where fast-moving cranes are concerned, reliance has to be placed on the efficiency of the brakes. Finally, another method is to place detonators on the track, but here again workpeople in some instances object to them. In the author's view, the use of red lamps and look-out men in each driver's cabin seems the best.

In 1949, there were 25 accidents, four of them fatal, resulting from persons being trapped between roof structure and some part of the bridge of overhead travelling cranes, or between the crab mechanism and some fixed part of the crane. The Author described an accident due to the inadvertent closing of an isolating switch because a warning board fell from its position. Seeing no notice on the switch, the driver closed it and operated the crane. It so happened that at that moment a fitter's mate was passing the main travel motor on the inside and was crushed between the crab and the motor. He received fatal injuries. This accident, states the Author, illustrates two points:—(*a*) Lack of consideration by crane manufacturers to safety for maintenance personnel, at the design stage; and (*b*) a slip-shod system of safety supervision by the occupiers.

In the case of (*a*) the makers provide an access catwalk on the gantry and then proceed to obstruct it with the main travel motor. In the case of (*b*) there should be either a method of positively locking the isolator switch in the " off " position, or alternatively, an isolator on the gantry catwalk which can be operated by men working there, the first alternative being the more desirable.

Crane Guards

All gearing accessible from workplaces such as crane catwalks, etc., should be securely guarded, the driving shaft and couplings for main travel should be securely guarded, whether they be placed just above the bridge as is usual, or beneath the bridge within the bridge structure. A safe means of access should be provided not only to the driver's cabin but also to the bridge, and there should be some emergency system to enable the driver to leave his cab should the need arise when the crane is not at the access platform; it should not be necessary for him to clamber out and along the track. Special escape-gear can be obtained for this purpose, although the Author prefers the ordinary rope ladder. Some people advocate a single rope because men find difficulty in using a rope ladder.

A common cause of accidents on overhead cranes is the falling of spanners and other tools which are left on the crane platform by maintenance men. Such tools and other loose material are later kicked over the edge of the platform. As is often the case in safety matters, the remedy is simple. Toe boards of adequate height should be fitted to the edges of all crane platforms, and indeed to platforms of any type. In the Building Regulations where the provision of toe boards is made a statutory requirement, the height of toe boards is given as not less than 8 in.

Jib Cranes

During 1949 there were 47 accidents due to the overturning of jib cranes, 27 of these cases relating to mobile jib-cranes as distinct from cranes operating on rail tracks. Experience suggests that with these types of cranes far too little attention is paid to the use of the safe-working-load indicator, and, in the case of track cranes, to the conditions of the rail tracks. Extra care is needed when using mobile jib-cranes on sloping and uneven ground, for this has a pronounced bearing on the safe working load of the crane, and if such conditions are not properly assessed the crane may well overturn. It is important, then, that in the case of track cranes, the tracks should be well maintained, and any slope in track borne in mind when operating the crane in relation to its safe working load. This, of course, applies to a greater degree with mobile trackless cranes.

Opaque-stop Microscope

Mr. W. M. Lomer, M.Sc., B.A., and P. L. Pratt, B.Sc., have summarized a Paper on "The Opaque-stop Microscope as a Means of Studying Surface Relief" which was presented to the Institute of Metals in the following statement:—

"The study of slopes and surface irregularities under the conventional microscope is difficult because the high numerical aperture means that the objective collects light reflected over a wide range of angles (up to $\sin^{-1}$ NA); and only if the slopes of the surface are comparable with this angle will the structure be visible. The opaque-stop microscope enables the sensitivity to angle to be increased by a factor of about thirty, so that at a magnification of $\times 6$ with a single lens of 5 in. focal length a sensitivity of 1′, and with NA 0.45 (total magnification $\times 200$) a sensitivity of about 1 deg. can be obtained.

"In addition, the opaque-stop arrangement can give the effect of either sensitive dark-field, or of oblique, illumination, and is available even at high magnification where the objective-mount design prevents the use of true oblique illumination. These effects must play some part in the formation of phase-contrast images, especially where heavily absorbing phase rings are used. It would perhaps be useful to be able quickly to replace the phase ring by an opaque stop in order to compare the images and eliminate some of the possible errors of interpretation."

B.S. Code for Sampling and Analysis of Flue Gases

A British Standard (B.S. 1756:1952) has been prepared to guide industrial-fuel consumers in selecting a procedure which may be adopted in sampling and analysing flue gases. It covers not only flue gases from steam-raising appliances and heating boilers, but also those produced in the manufacture of iron, steel, nonferrous metals, pottery, refractories, heavy clay-ware, food, cement, glass, certain chemicals and coal gas. Methods are given for the determination of the following gases:—Carbon dioxide; oxygen; carbon monoxide; hydrogen; methane; moisture; oxides of sulphur, and oxides of nitrogen. Amongst the apparatus described are the Orsat apparatus for determining carbon dioxide, oxygen and carbon monoxide, and the Haldane apparatus for carbon dioxide, oxygen, carbon monoxide, hydrogen and methane. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 24, Victoria Street, London, S.W.1. Price 10s. 6d. post free.

To Make Your Voice Heard

This is the title of a propaganda booklet issued by the Council of Ironfoundry Associations (Crusader House, 14, Pall Mall, London, S.W.1). The reviewer has in the past thought out many reasons for joining employers' federations and the like, but in this booklet practically every reason has been classified and listed. There is one, however, which has been missed out, and that is the valuable friendships that can be, and are, made. To this great importance can be attached. After all, in foundry employer circles, except, of course, the specialized groups, one meets but few competitors, yet dozens who will both co-operate and help. This brochure has been prepared for distribution by founders to founders, and by its precepts being followed the whole industry will benefit.

United Steel Companies' Plans

Production of steel ingots by the United Steel Companies, Limited, in the 15 months ended September 29, 1951, totalled 2,548,000 tons. Pig-iron output in that period was 1,375,000 tons, and that of coke 1,490,000 tons. The company's annual report states that production had been handicapped during the latter part of the period by the general scarcity of scrap, especially at the Steel, Peech & Tozer branch.

"The exceptional supplies of scrap which have been available in recent years are exhausted and this loss must be made good by pig-iron," the report continues. In anticipation of the approaching need for more pig-iron, a large addition to the ore-treatment plant at the Appleby-Frodingham branch was begun four years ago. This was now in production and a corresponding increase in pig-iron output had been obtained from the existing blast furnaces. In order to meet the still greater need for pig-iron, two additional large blast furnaces were now under construction. It was expected that when these were put into operation in 1954 sufficient pig-iron would be made at the Appleby-Frodingham branch to make up for the deficiency of scrap at all the company's branches.

Unemployment Rise Continues

The latest Ministry of Labour statistics show that the total working population rose by 28,000 during January, this rise being equivalent to that which took place in January, 1951. In the metals, engineering, and vehicles group, employment rose by 19,000 to 4,229,000 and the number of wage earners on colliery books increased by 7,000 to 705,000. There was a rise of 3,000 in the number employed in the basic industries, bringing this total to 4,077,000.

The total number of unemployed at February 11 was 393,500, an increase of 14,700 over the total at January 14. Of this figure 129,200 had been unemployed more than eight weeks, and 67,000 were temporarily stopped. The number of men unemployed for more than eight weeks was 83,242, 15,000 fewer than the number a year ago. Unemployment represented 1.9 per cent. of the estimated total number of employees, compared with 1.8 per cent. in January, and 1.5 per cent. in February, 1951.

Italian Iron and Steel Outputs

Although the Italian economic situation is as yet by no means satisfactory, a review by the Association of Italian Joint Stock Companies shows that notable progress was made in 1951.

Output of pig-iron reached 929,000 tons last year, against 506,000 tons in 1950, an increase of 84 per cent., while production of raw steel, at 3,048,000 tons, compared with 2,362,000 tons, was 29 per cent. up on 1950.

In the engineering trades, depression continues, the one exception being the automobile factories, whose output, although showing signs of decline during the summer months, improved later in 1951.

Power Transmission. A quite-impressive catalogue has reached us from Crofts (Engineers), Limited, of Bradford, Yorks. It covers two main aspects, the first of which is to give the reader a proper impression of the works and the second to illustrate the products. The two have not been separated in the physical sense, but as each department is illustrated, there are pictures of the products. The catalogue is bound with an interlocking plastic fitting, and is printed in two colours—orange and black. As a general catalogue the publication shows much merit.

Diesel Engines in Canada

Opportunities for U.K. Manufacturers

The market in Canada for all types of Diesel engine is increasing, and seems likely to continue to increase for some time, according to a digest prepared by the United Kingdom Trade Commissioner Service in the Dominion.

No Diesel engines for road use are at present made in Canada. For all practical purposes, all the engines in use are imported from the United States and from the United Kingdom, the U.S. having by far the larger share of the business.

Apart from the demand for engines for vehicles, there is a steadily expanding market in Canada for Diesel engines for power shovels, cranes, tractors, bulldozers, graders, road rollers, compressors, etc.; as power units for saw mills and other industrial purposes; for emergency lighting plants; for agricultural equipment, and for similar purposes.

There is a considerable potential market for generators in coupled units as an auxiliary lighting or power supply for department stores, hotels, large office blocks, factories, pulp and paper mills, saw mills, etc.; on the other hand, the demand for small generating sets in outlying districts is likely to diminish as hydro-electric services are expanded. It is possible, also, that a market for small Diesels (3 to 30 h.p.) might be found among timber operators. Timber supplies for the pulp mills are cut on the logging site into 4-ft. lengths, either by hand or by a small portable saw mill. Petrol engines (often converted automobile engines) have been mainly used in the past, but operators might be educated in the advantages of the Diesel.

Spares and Servicing

Engines of United Kingdom manufacture can compete with most American and Canadian products in design, weight per horsepower, efficiency of operation, cheapness of maintenance, and in price, which, in many cases, is lower than that of the American product. There is, therefore, no reason why British manufacturers should not enter the market more extensively, but if they decide to do so they must do so wholeheartedly and establish an efficient organization with fully qualified staff for spares and servicing, preferably in the form of a Canadian subsidiary company. Delivery of parts must be from stock, since no operator can afford the risk of having his equipment tied up during his working season while parts are being shipped from the United Kingdom.

There are only three customers for standard-gauge Diesel locomotives—Canadian National Railways, the Canadian Pacific Railway, and the Quebec North Shore and Labrador Railway, the last named being a newcomer to the field. Total demand is estimated at 100 to 120 locomotives a year. These three customers deal almost exclusively with three Canadian manufacturers—Montreal Locomotive Works, Montreal; Canadian Locomotive Company, Limited, Kingston, Ontario; and General Motors Diesel, Limited, London, Ontario, all three being subsidiaries or associates of American firms. The potential output of the three locomotive manufacturers is said to be about three locomotives a day, a supply far in excess of total Canadian railway requirements, and a very considerable and lasting effort would have to be made by any newcomer before he could hope to sell Diesel engines to the present manufacturers. On the other hand, it would seem to be worth while to investigate the possibility of an arrangement with a Canadian concern for the manufacture of a suitable United Kingdom Diesel engine under licence in Canada.

Narrow-railway construction in Canada is now almost entirely confined to mines, quarries, special engineering projects, and to a number of isolated logging operations. A few narrow-gauge works and dock railways are still in use, but new construction is invariably of standard gauge to facilitate shunting of main-line rolling stock. Diesel locomotives for these narrow-gauge railways are not made in Canada—an indication of the limited market. United Kingdom and American Diesel locomotives have now, however, been successfully introduced in some fields despite strong competition of alternative haulage methods.

As there is no Canadian manufacture of narrow-gauge Diesel locomotives, the market for Diesel engines as such is negligible. On the other hand, it would seem reasonable to believe that sooner or later there will be some local production, and with this in view United Kingdom Diesel-engine manufacturers, among whom are many foundry concerns, are advised to keep in touch with the situation.

News from Norway

Norway's production of raw aluminium in 1951 was about 50,000 tons, produced principally by Ardal Verk, Det Norske Nitridaktieselskap (D.N.N.), and the Norwegian Aluminium Company. Production will be increased by another 40,000 tons a year when the new Sunndalsora plant comes into operation in 1954.

Norwegian shipyards employed nearly 13,000 men in 1951, about the same number as in 1950; but 42 vessels, totalling more than 100,000 tons dw., were delivered, this tonnage being about 25 per cent. more than in the previous 12 months, and the highest total for a single year since the war.

Tonsberg Harpunfabrikk A/S (Tonsberg) have erected a new galvanizing plant, said to be the largest in Norway.

Norsk Bergverk A/S has raised the question of working the nickel-containing ores at Ballangen. The deposits, if worked, are estimated to be capable of yielding some 20,000 tons of pure nickel during 20 years of operation. Norsk Bergverk A/S has also asked the Norwegian Ministry of Finance for a grant for experimental and laboratory tests to be carried out in connection with the pyrites obtainable from Grong.

The three 12-ton bronze propellers of the former German warship, Blucher, sunk in Drobak Sound, have been salvaged from a depth of 300 ft. and taken to Germany. The final salvaging work on the ship has been left pending the arrival of two floating cranes from Hamburg.

In 1951 Norway's hydro-electric generating capacity was increased by 150,000 kW. New installations to be completed in 1952 will yield a further 160,000 kW., in 1953 180,000 kW., in 1954 210,000 kW., and in 1955 270,000 kW. At the end of the war there were about 700,000 people without domestic electricity; now there are only 300,000.

International Nickel's Record Year

Ore production, sales, earnings, capital expenditure, wage payments, and dividends of the International Nickel Company of Canada, Limited, were all at record levels in 1951.

The report for the year shows that the net earnings of the company and its subsidiaries were $62,875,571 (in terms of U.S. currency), equivalent, after preferred dividends, to $4.17 per share on the common stock. They compare with $48,765,849, or $3.21 per common share, for the previous year.

Establishing new records also in net sales, taxes, payrolls, dividends, and capital expenditures, the year recorded, as well, a new peak in ore produced. This performance was effected despite the operational problems of carrying on the mining of this greater amount of ore while simultaneously expanding progressively the scope of the company's underground mining operation to replace loss of open-cast yield.

During 1951, 7,780,143 short tons of ore were mined from underground, compared with 5,733,269 tons in 1950. The open-cast ore mined was 4,019,177 tons, compared with 4,115,755 in 1950.

Total ore mined in 1951 was 11,799,320 tons, compared with 9,849,024 tons a year before and with an average of 10,500,000 tons annually during the five war years 1940-44 and 5,300,000 tons during the five pre-war years. When the changeover to all-underground mining is accomplished, the report notes, the company will be able to raise 13,000,000 tons of ore a year, which is 5,200,000 tons more from underground than the record tonnage raised in 1951.

Although production increased, the year's total deliveries of nickel in all forms of 121.932 net tons were less than the 128,205 tons in 1950, when the smaller production of that year was augmented by deliveries from stocks accumulated in 1949.

Deliveries in 1951 of refined copper and of platinum metals exceeded those of any other post-war year, the report discloses. In the former case the increase was 11 per cent over that for 1950. The more than 40 per cent. increase in deliveries of platinum metals is attributed principally to the larger demand for palladium for industrial, dental, and jewellery applications.

The output of nickel was increased by mid-year to equal the 10,500 tons per month average rate achieved during the war. This was made possible through the installation of emergency facilities ahead of schedule and through further expansion of underground operations.

Road Haulage Rates to go Up

At a meeting in London recently, the national rates committee of the Road Haulage Association, the national body representing free enterprise hauliers, recommended members to increase their rates for general haulage by one-tenth from April 1. This increase would cover substantial additional costs in wages, fuel, maintenance, and other items.

Hauliers remaining under free enterprise operate 120,000 vehicles, against 40,000 operated by the nationalized Road Haulage Executive.

IT IS PLANNED to distribute the natural gas found in the Netherlands province of Drente. The gas will be bought by the State and re-sold to the local municipal gas undertakings at a price equivalent to that of coal-gas.

Personal

MR. BORGERHOFF has been re-elected president of the *Association Technique de Fonderie de Belgique.*

MR. J. R. WAGNER, director, Electric Steel Castings Company, has been nominated president of the American Foundrymen's Society for 1952-53.

SIR SAMUEL ROBERTS, chairman of Newton Chambers & Company, Limited, engineers and ironfounders, of Sheffield, and the Wellman Smith Owen Engineering Corporation, Limited, has left on a business trip to South Africa.

MR. H. M. PARKINSON, manager of the Grantham Ironworks Company, Limited, Springfield Road, Grantham, has been elected to the Board of directors. Mr. Parkinson took up his position at Grantham in April, 1950, after completing a tour of duty in India.

SIR LAWRENCE EDWARDS, chairman and managing director of the Middle Docks & Engineering Company, Limited, South Shields, has been appointed independent chairman of the housing production Board for the Northern Region of England.

MR. J. S. EXLEY, publicity manager of Richard Sutcliffe, Limited, manufacturers of mechanical handling plant, of Wakefield (Yorks), has been appointed the company's Continental representative. MR. V. QUAINTRELL has been appointed chief buyer of the company.

MR. W. C. SHELTON has retired after 36 years' service from the position of senior representative of the Hoyt Metal Company of Great Britain, of Putney, S.W.15, and Tolworth, Surrey, and a presentation from his colleagues was made to him at a dinner given by the Company recently.

MR. W. ALAN BREW, assistant manager of Harland & Wolff, Limited, shipbuilders and marine engineers, etc., of Belfast, has been awarded a certificate and cheque by the Engineer Officer's Union for having obtained the highest marks in the United Kingdom in the first-class examination for engineer officers.

MR. J. E. BELLISS, who has been a director of Belliss & Morcom, Limited, Birmingham, since 1938, is to become managing director next month. A member of the council of the British Electrical and Allied Manufacturers' Association, Mr. Belliss joined the family firm in 1924 as an apprentice, having a complete training in the works and later associating himself with the commercial offices of the company. He is chairman of the subsidiary firm, British Arca Regulators, Limited, London.

MR. N. A. DUDLEY, senior lecturer in management studies at the Wolverhampton and Staffordshire Technical College, has been appointed lecturer in work study in the postgraduate school of engineering production at Birmingham University. Mr. Dudley, who is an honours graduate in industrial economics and sociology of London University, a member of the Institution of Production Engineers, and of the Institute of Industrial Administration, is a member of the general council of the Institute of Economic Engineering.

MR. G. M. FLATHER, the Master Cutler, presided at the annual Cutlers' Feast, which was held in the Cutlers' Hall, Sheffield, on Friday. Mr. Flather is the second son of a former holder of the office and is joint managing director of W. T. Flather, Limited, a firm founded by his great-grandfather in 1817. Among his many interests in the steel industry, Mr. Flather is a council member of the British Iron and Steel Federation, and recently completed a three-year term on the council of the British Iron and Steel Research Association.

Obituary

THE DEATH occurred in South Africa last month of MR. H. R. PATTULLO, formerly director and secretary of Smith & Wellstood, Limited, Bonnybridge, and lately managing director of the firm's factory at Springs, Johannesburg.

THE DEATH has occurred in Copenhagen at the age of 77 of DR. HANS H. BLACHE, a pioneer in the development of the marine oil engine. Dr. Blache took his degree in mechanical engineering at the Royal Technical University, Copenhagen, and was associated with Burmeister & Wain for many years, becoming managing director in 1919. During that time he was often in touch with British companies and associations, and in 1936 he left Burmeister & Wain and for some years afterwards was connected in a consultative capacity with Harland & Wolff, Limited, shipbuilders, of Belfast, which had close ties with the Copenhagen company in the manufacture of oil engines. Among the many honours conferred on Dr. Blache for his invaluable work in mechanical and marine engineering was the James Watt International Medal which was awarded to him in 1951 by the Institution of Mechanical Engineers.

Recent Wills

COX, A. S., formerly assistant comptroller, H.M. Patent Office £5,121

BAILEY, HAROLD, a director of William Bailey (Birmingham), Limited, brassfounders £16,193

DUNLOP, W. I., proprietor of Wm. Dunlop & Company, iron and steel merchants, etc., of Glasgow ... £21,758

MORTON, HAROLD, a director of Joseph Morton, Limited, manufacturers of refractory materials, of Halifax £40,156

SHARVELL, W. A., a former director of Richard Cooper & Son (Wolverhampton), Limited, lock manufacturers £385

FLETCHER, JOHN, managing director of S. Walker, Limited, brass and iron founders, of Radcliffe (Lancs) £10,251

YANNEDIS, P. S., governing director of Yannedis & Company, Limited, brassfounders and lockmakers, of London, W.C.1 ... ... £18,463

GIVINS, H. S., secretary and managing director of Matterson, Huxley & Watson, Limited, ironfounders, of Coventry £21,109

HEWLETT, H. B., former senior engineer and geologist with the quarries department of the Stanton Ironworks Company, Limited, Nottingham £6,953

MELLANBY, PROF. ALEXANDER LAWSON, Professor of Civil and Mechanical Engineering at the Royal Technical College, Glasgow, and chairman of the Glasgow and West of Scotland Commercial College in 1946 ... ... £8,164

VINES, ADOLPH, founder and chairman of Eversheds & Vignoles, Limited, electrical instrument manufacturers, of London, W.4, a member of the council, management board, and conference committee of the Engineering and Allied Employers' National Federation, vice-president of the British Engineers' Association, and vice-chairman of the British Scientific Instrument Research Association £69,403

International Fishing Exhibition.—From June 14 to 30, there is to be held in Boulogne-sur-Mer, an exhibition of everything appertaining to sea fishing. It is to be a very large affair, with no fewer than 1,500 stands covering an area of 550,000 sq. ft. As some of our readers who service this large industry (which includes canning, refrigeration plant and packaging) with castings may wish to participate in a week-end visit to the exhibition they may have details by visiting the Editor of the *Fish Trades Gazette*, published from this office.

Internally Coating Underground Pipes

While ordinary bitumen possesses valuable preservative properties, research has shown that for the internal coating of underground pipes, other corrosion-resisting ingredients are necessary. Mercol Products, Limited, Eyre Lane, Sheffield, 1, have given this matter intensive study, not only devising a satisfactory composition known as "Mercoloid," but also an ingenious method of applying it under pressure to pipes *in situ*. The system is explained in a brochure recently issued by the firm. In the investigation, the problem of coating by remote control was studied, experiments being conducted on the theory that a pipe is a natural compression chamber or cylinder, and as such, lends itself to the application of a viscous coating under piston pressure. It was recognized that underground pipes contain water or moisture which acts as an insulator against coating materials applied by ordinary methods.

In this connection, work proceeded on the basis that the water should be either removed, or neutralized, or made to perform a co-operative function in the method of coating. It was found that hydraulic pressure in the primary stages of application caused the water to act as a lubricant for the heavier bitumen, with the result that a wet pipe could be coated just as easily and efficiently as a dry pipe. A final test, going well beyond the limit of conditions likely to be encountered, proved that a smooth, glass-lined pipe, partially filled with water, could be quickly and efficiently coated by the hydraulic method adopted.

Sections of pipelines up to 300 yds. in length can be coated in a single operation, but the process obviously is not suitable for application to pipelines which have service lines branching off. It can be most economically employed where unbroken sections of pipe of at least 50 yds. between junctions or acute angles require treatment.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained.

BELFAST, April 9—Brass and copper fittings, etc., cast-iron pipes and fittings, flexible metallic tubes, iron castings, purifier grids, etc., for the City Council. The Gasworks, Ormean Road, Belfast.

BROUGHTON, March 28—Hydrants, boxes, lids, and adaptors, for the County Council. The Chief Officer, Lancashire County Fire Brigade, Hazelmere, Garstang Road, Broughton, near Preston

CHADDERTON, April 5—Castings, for the Urban District Council. The Engineer and Surveyor, Town Hall, Chadderton.

DARTFORD (KENT), March 28—Manhole covers and frames, gully grates and frames, and inspection covers and frames, for the Rural District Council. Mr. B. F. Kirby, engineer and surveyor, Council Offices, West Hill, Dartford.

EDINBURGH, April 19—Hydrants, hydrant outlets, cases and covers, for the South-Eastern Fire Area Joint Committee. The Firemaster, Central Fire Station, Lauriston Place, Edinburgh, 3.

SKELTON AND BROTTON, April 1—Cast-iron gully grates and manhole covers, for the Urban District Council. The Engineer and Surveyor, Council Offices, Skelton-in-Cleveland.

GODALMING, April 5—Supplying and laying approx. 590 yds. of 4 in. and 6 in. spun-iron water main, for the Borough Council. Mr. C. B. Spivey, water engineer, Branksome, Filmer Grove, Nightingale Road, Godalming. (Deposit, £2 2s.)

Publications Received

The Story of Mond Nickel, by A. C. Sturney. Issued by the Mond Nickel Company, Limited, for private circulation.

This very charming book has been illustrated by Eric Fraser with a series of delightful pictures of people eminent in the development of nickel. In his work, the artist uses quite long parallel lines, reminiscent of the French artist Decaris. It is straightforward history, but only deals with those from the top shelf, and the names of those so familiar to the foundry industry have not been included. It can be presumed that, in such a large organization, it would be difficult to know where to stop. Mr. Sturney writes well and the book makes very pleasant reading.

Pioneers for a Century 1852-1952, by T. Alec Seed. Published by Samuel Osborn & Company, Limited, Clyde Steel Works, Sheffield.

This well-illustrated book is for the major part biographical, because it can be assumed that in the early days of manufacturing the owner counted for more than the team. Samuel Osborn, the founder, was a shining example of an enterprising manufacturer in an area of expanding industry, but, moreover, he was a pioneer in his efforts to reduce industrial health hazards amongst his men. He had high ideals for public service, an attitude which animated those who followed him. This book certainly should have contained a genealogical tree of the proprietors and Board of directors, and also, perhaps, a table showing chronologically the main developments made. The reviewer would like to associate himself with the many congratulations that must have been received on the completion of a century of benevolent progress.

Welding, Brazing and Soldering of Copper and its Alloys. Published by the Copper Development Association, Kendals Hall, Radlett, Herts.

This practical handbook deals with the jointing of copper and copper alloys. After treating in an elementary manner some of the relevant properties of metals, separate chapters are devoted to fusion welding, bronze-welding, brazing (including some notes on the copper brazing of steel), and soft soldering. All the major processes and many others are described in considerable detail and examined as to their suitability for copper and its alloys. The last chapter, which is concerned with the jointing of dissimilar metals, is followed by a comprehensive bibliography and some useful tables. This book, which contains 81 illustrations, is free to readers on application to Kendals Hall.

Accidents, How they Happen and How to Prevent them, Vol. 10. Published for the Factory Department, Ministry of Labour and National Service, by H.M. Stationery Office. Price 9d. net.

In this issue, the pictures are somewhat less obnoxious than usual. The extreme horror usually evident on the faces of the victims has been diminished. There are two foundry accidents reported. One relates to mould conveyors, where the gaps between the plates or between them and any fixed structure can be a real accident hazard. Apparently they can be provided with guards. The second relates to the falling of accumulated slag and skull from the spark arrester of a cupola on to the arm of a man making up the bottom. His hand was amputated. Protection was given by a strong cover for the men during patching but was removed on completion. Thus the top protective cover should be kept on until the last minute and the arrester should be cleaned regularly.

New Catalogues

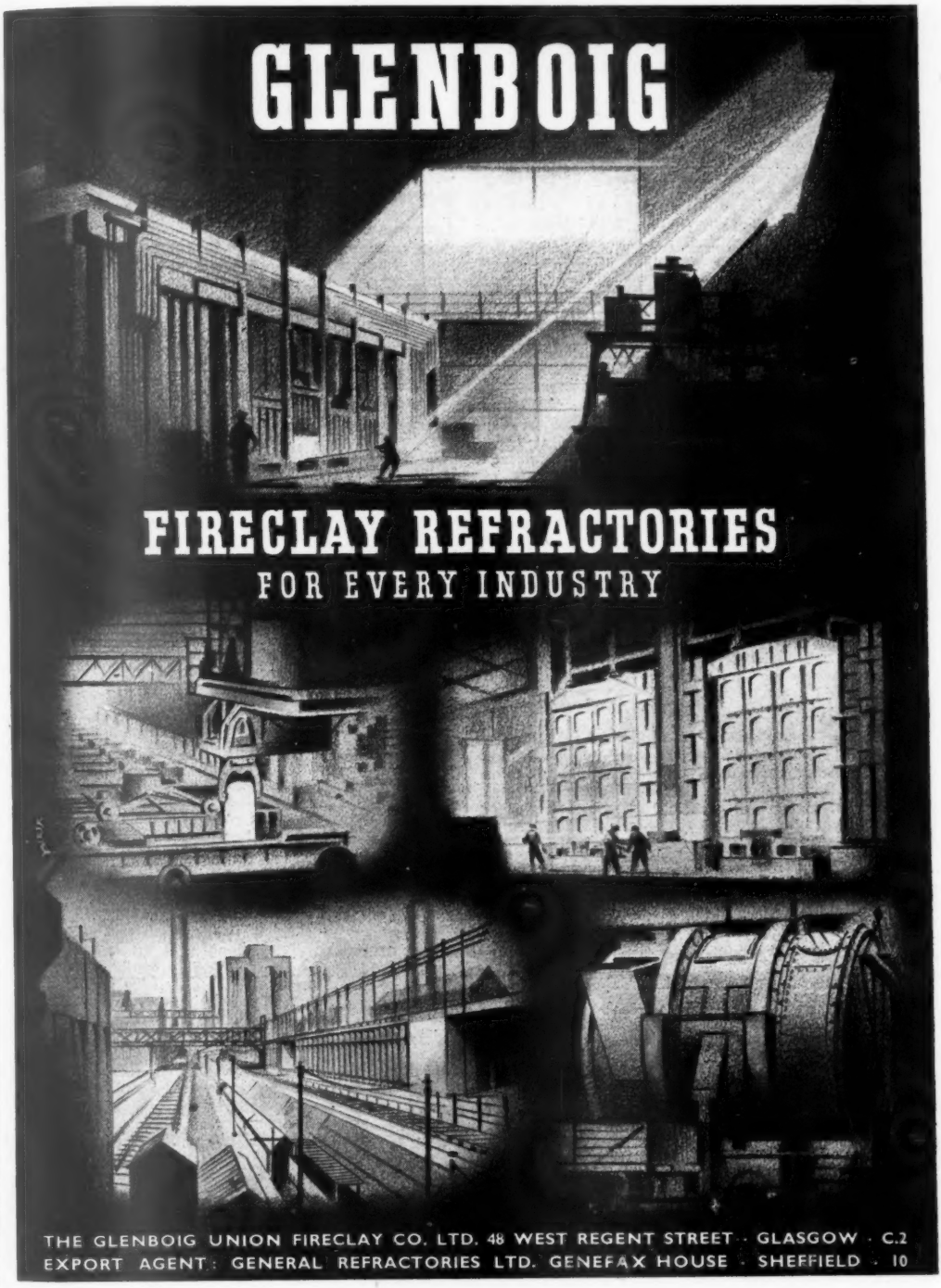
Fused Alumina Ware. Excellent use of display has been made by the Morgan Crucible Company, Limited, of Battersea Church Road, London, S.W.11, in a four-page pamphlet covering the subject of "Triangle" laboratory ware in fused alumina (90 to 91 per cent.) pure (99 per cent.) and recrystallized (99.7 per cent.). Such materials when made into tubes, crucibles and the like are highly refractory and, moreover, carry other useful properties which the leaflet sets out.

Refractories. Recent technical progress in the manufacture of refractories is well exemplified in the latest pamphlet issued by John G. Stein & Company, Limited, of Bonnybridge, Scotland. Under present conditions such publications are taking on more and more the aspect of those borne by steelmakers' publications, as they are full of useful tabular matter. In this one, for each type of brick, all the physical properties are listed, whilst the standard sizes of bricks and shapes are all quoted. This catalogue makes a serious and worthwhile contribution to one's trade literature library. It is available to our readers on writing to Bonnybridge.

Dust Control. On the cover of a four-page leaflet received from Air Control Installations, Limited, of Ruislip, Middlesex, a very effective form of cross-hatched background has been used. It certainly brings into relief an impressive picture of a Rotoclone dust-collector. The leaflet has been carried out in a wine colour, a tint not often used in trade literature. It describes and illustrates four types of collectors which are designed to eradicate the dust problem at the source. As this subject is much to the fore nowadays, readers would be well advised to acquire a copy by writing to Ruislip. A second catalogue received from this company details within its twenty pages the general productions regularly turned out.

Hardened Steel Bushes. A four-page leaflet received from the Self-Priming Pump and Engineering Company, Limited, of Parliament Mansions, Victoria Street, London, covers a line of goods of outstanding value to foundrymen. The components described and illustrated are the Walker hardened-steel split bushes, which after insertion by hand are locked into position by a tapered key. The range of bushes made is quite wide and covers pin diameters from ¼ to 5¼ in. They are being used in foundry practice for moulding boxes, sand-hopper gates, bucket elevators, and link and pin conveyors. The leaflet is printed on yellow paper and is just "businesslike." It is available to our readers on writing to Parliament Mansions.

Solid-fired-fuel Cookers and Stoves. Radiation, Limited, Radiation House, Stratford Place, London, W.1, have sent us leaflets, which no doubt are meant for the distributors and ultimate users of the Yorkvale cooker, and the Cheston continuous-burning fire. The Yorkvale is of the type of cooker which is continuous in operation and incorporates a boiler. It uses 1½ to 2 cwts. of fuel a week. The Cheston also is a continuous-burning model and the leaflet describing it is by far the better piece of publicity as the bright orange/red is well suited to the subject. Though two-colour printing has been used for publicizing the Yorkvale, the result has not been quite so happy. Whilst radiant lines have been used for stressing the central object—the stove itself—a larger picture such as appears overleaf would, the reviewer thinks, have had a greater appeal.


GLENBOIG
FIRECLAY REFRACTORIES
FOR EVERY INDUSTRY
THE GLENBOIG UNION FIRECLAY CO. LTD. 48 WEST REGENT STREET · GLASGOW · C.2
EXPORT AGENT: GENERAL REFRACTORIES LTD. GENEFAX HOUSE · SHEFFIELD · 10

117

News in Brief

THE INCORPORATED PLANT ENGINEERS are to hold their annual conference at Harrogate from May 21 to May 23.

SIX THOUSAND EMPLOYEES of the Raleigh Cycle Company, Limited, Nottingham, will visit Morecambe on May 24.

EMPLOYEES of the Jet Unit, Rolls-Royce, Limited, Derby, held their annual dinner recently at the Greyhound Hotel, Derby.

FERROUS CASTINGS LIMITED, of Warrington, at a social evening held on March 7, presented long-service awards to fifteen of their employees who have completed twenty-five years' service and over.

MR. W. M. WATSON, a director of Herbert Morris, Limited, Loughborough, announced at the annual presentation of prizes in the staff canteen that the number of apprentices under training at present is ten times greater than in 1946.

THE INSTITUTE OF COST & WORKS ACCOUNTANTS, 63, Portland Place, London, W.1, is organizing a public meeting at the Beaver Hall, Great Trinity Lane, London, E.C.4, on April 1, at 5.15 p.m. to consider the accountancy of changing price levels.

MR. D. F. B. TEDDS points out that in the paper, "Experiences with the Investment Casting Process" printed in last week's JOURNAL, the dimension of the flame-tube was given on page 299 at 14 ft. 5 in. instead of 14.5 in. as is also clear from the illustration. We apologize for this error.

THE SPRING MEETING of the Institute of Welding is being held this year in Glasgow from April 24 to 26 inclusive. The meeting is being organized in co-operation with the West of Scotland branch. Full details may be obtained from the secretary at 2, Buckingham Palace Gardens, London, S.W.1.

THE MORE MATHEMATICALLY MINDED amongst our readers will find much to interest them in an advance copy of a paper to be read before the Institution of Mechanical Engineers by Dr. J. Kestin and Mr. J. A. Owczarek on "The Expression for Work in a Root's Blower." It is available on writing to the Institution at Storey's Gate, St. James's Park, London, S.W.1.

THE DERBY AND DISTRICT ASSOCIATION of the Engineering and Allied Employers' National Federation last week held their annual dinner at the Jacobean Cafe, Derby; among those present were Wing-Commander J. M. Aiton, Mr. R. H. Buckland (president), Mr. H. Clarke, Mr. A. G. Elliott, Mr. R. J. Fleming, Mr. V. Jobson, Mr. F. D. Ley, Mr. H. R. Newman, and Mr. H. J. Swift.

BELLS for a carillon to be hung in the 145-ft tower of Walsall Town Hall have been cast at the works of John Taylor & Company, Loughborough. The cost of the carillon is approximately £4,000 and is to be met from the estate of Mr. J. A. Leckie, a former M.P. for Walsall. It consists of 14 bells, weighing about 3½ tons, which provide a fine example of the foundryman's art. The carillon is to be electrically operated.

W. EDWARDS & COMPANY (LONDON), LIMITED, of Worsley Bridge Road, Lower Sydenham, London, S.E.26, specialists in high-vacuum equipment, will have a number of special exhibits of interest to foundrymen and laboratory technicians at the Physical Society exhibition to be held in the Imperial College, Kensington, from April 3 to 8. These will include diffusion pumps; oil diffusion booster pump; a mobile leak-detector plant with refrigerator cooling, and various vacuum gauges.

REPLACEMENT of corroded underground pipes is estimated to cost this country £50,000,000 per year. Cathodic methods of protection, as used, for example, on the £2,000,000 oil pipeline from Finnart to Grangemouth in Scotland, show promise of becoming an economic and effective way of cutting this bill. Application of the method, however, will only be effective if the fullest possible information on the subject is examined, correlated and made available to all interested bodies. The most convenient body to do this is the British Iron and Steel Research Association sub-committee (chairman, Mr. L. C. Whiskin, of the Metropolitan Water Board), which has been entrusted by the Minister of Health with the co-ordination of research on this subject.

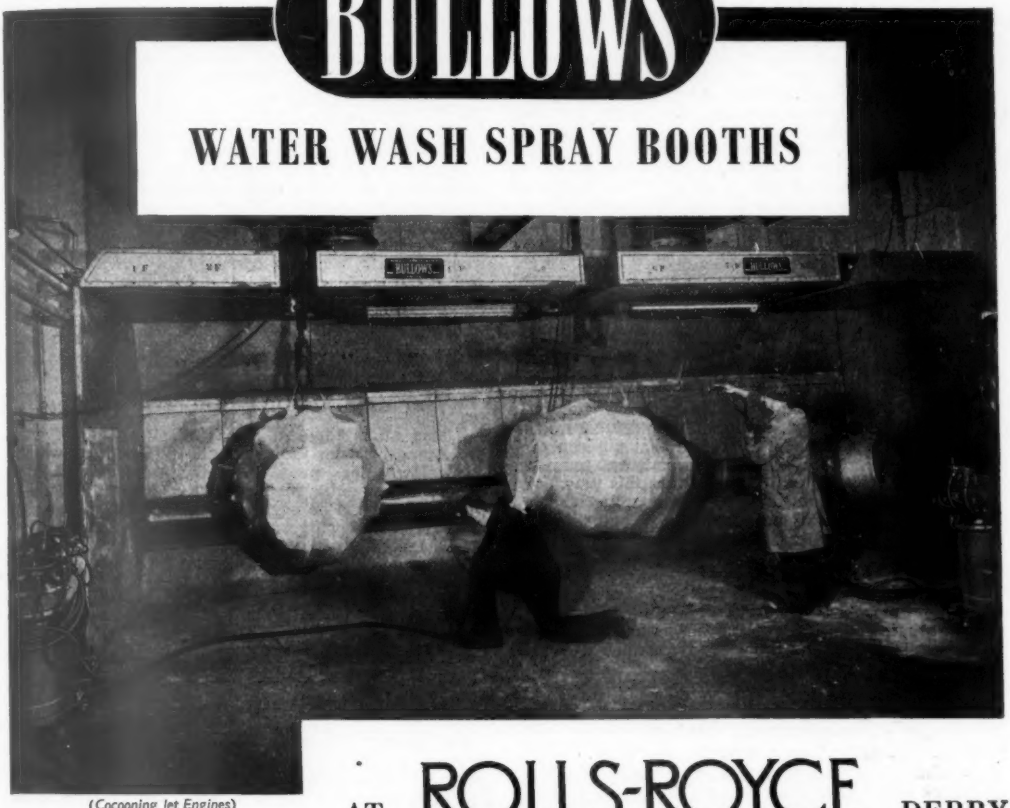
IN A WRITTEN REPLY to a question from Mr. C. J. Simmons, M.P. for Brierley Hill, Staffs, who asked if the Minister was aware that, owing to the shortage of iron and steel scrap, the Round Oak Steelworks, Brierley Hill, was not producing two-thirds of its capacity and that trained men had become redundant, Mr. Duncan Sandys, Minister of Supply, said "I am aware that substantial supplies of scrap are going from the Midlands, as they have always done, to such areas as South Wales, but if these supplies were reduced, it would aggravate the shortage of scrap in those areas." Mr. Simmons had urged that, as there is an annual surplus of 450,000 tons of scrap in the Midlands, the Minister should take steps to ensure that it was not transferred to other areas as long as steelworks in the Midlands were willing and able to use it.

SPEAKING at the annual banquet of the Coventry Chamber of Commerce on March 13, Sir William Rootes, chairman of the Dollar Exports Council, urged manufacturers to "roll up your sleeves and use every moment of your waking hours thinking in terms of export, particularly to the dollar areas." Sir William, who has recently returned from a business trip to the North American continent, had, among his audience in Coventry, the High Commissioner for Canada, Mr. L. Dana Wilgress, who later proposed the toast of "The trade and industry of Coventry." "There is no reason to fear that the continued growth of Canadian industry will reduce the opportunities for trade between Britain and Canada," Mr. Wilgress said, adding, "I think the opposite is true." He went on to say that Britain will continue to sell in the many fields in which her skill and industrial experience are renowned.

SIR ARCHIBALD FORBES, president of the Federation of British Industries, speaking at a luncheon in Birmingham on March 18, attended by Midland members of the Federation, gave what he called "a few observations on the Budget." It was most regrettable from the industrial standpoint, he said, that the burden of taxation on industrial profits should have been increased at a time when, in the interests of efficient production, they might have been reduced. He feared that the Budget had not brought home to the ordinary citizen the crisis conditions in which we are existing. The reason was that industry has been called upon to carry the main burden of taxation and if industry did not succeed in carrying it, the results would be grave. Success in increasing exports (on which the Budget hinged, said Sir Archibald), depended on industry's making a great effort to reduce costs, and this in turn was bound up with an adequate flow of raw materials, with managerial skill and a quick response from operatives to incentives for harder work.

BULLOWS

WATER WASH SPRAY BOOTHS



(Cocooning Jet Engines)

AT ROLLS-ROYCE DERBY

The results of our long experience are at your disposal. Consulting us incurs no obligation.

—typical of the many BULLOWS Water Wash Spray Booths installed in well-known Industrial Plants throughout the country.

SPRAY PAINTING EQUIPMENT · AIR COMPRESSORS

A. BULLOWS & SONS LTD

LONG STREET · WALSALL · STAFFS · TEL: WALSALL 5401

DEPOTS AT—13 SOUTH MOLTON ST., LONDON, W.1. · TEL. MAYFAIR 2313
55a BRIDGE STREET, MANCHESTER, 3. · TEL. BLACKFRIARS 5670
BULLOWS HOUSE, 9 BURGH QUAY, DUBLIN, EIRE. · TEL. DUB 21152
106, WHITEFIELD ROAD, GLASGOW, S.W.1. · TEL. GOVAN 2668

Raw Material Markets

Iron and Steel

All the foundries have more orders for castings than they can comfortably fill and their main concern is to secure adequate supplies of pig-iron. All grades of iron are scarce. The low- and medium-phosphorus irons are not produced in sufficient quantities and, with a decline in the output of hematite from some furnaces, it is difficult to keep plant fully operative. Other irons do not fill the gap. Efforts are made to secure increased quantities of refined iron, but outputs are restricted because of the lack of raw materials. The supply of high-phosphorus pig-iron to the light and jobbing foundries is also inadequate. The tonnages recently sent forward have been reduced, due in some instances to furnace troubles.

Scrap deliveries now being made and those expected for the steelworks are much below the quantities required for any expansion of output. To avoid the closing down of more steel furnaces and to bring into production those units now out of commission, the primary need is an increased blast-furnace production which would not only relieve the steel position, but would, it is hoped, avoid the necessity of changing over periodically from the production of foundry pig-iron to basic steelmaking iron. It is evident that pig-iron production must increase if the steelworks are to attain their output objective of 16,000,000 tons this year.

The difficulty in securing adequate supplies of scrap is also a handicap to the foundries. Competition is keen for any parcels which become available, and there is a dearth of all grades, particularly machinery and heavy cast-iron scrap.

Foundry coke despatches are regular, but are not fully up to the tonnages called for, and it is difficult to build up a working stock after current needs have been met. Ganister, limestone, and firebricks are available to meet demands, and the foundries using ferro-alloys can usually obtain their requirements.

Non-ferrous Metals

News that the contract between the United States and the Indonesian tin producers had been successfully arranged, after discussions which have dragged on for quite a while, came through last week. The contract is for 54,000 tons spread equally over three years, but the suppliers have an option to sell an additional 2,000 tons each year if they so desire. The price is $1.18 per lb. firm for the first two years, but the third year is subject to negotiation when the time comes. So it transpires that after all the Indonesians will not get $1.25 as they hoped for their tin. However, it may well prove that in accepting $1.18 they have done quite a good thing for themselves.

The successful conclusion of the Indonesian contract did nothing to hearten the London market which lost ground on the week's trading.

Talks have also been in progress between the Americans and representatives for the Belgian Congo, as a result of which it is believed that a contract will be arranged later in the year. It is also understood that the R.F.C. is in touch with the Bolivian producers. An official statement last week gave the information that by the end of this month it is anticipated that some 8,000 tons of tin will have been shipped to the United States by our Government.

London Metal Exchange official tin quotations were as follow:—

Cash—Thursday, £974 to £974 10s.; Friday, £969 to £970; Monday, £965 to £966; Tuesday, £961 to £962; Wednesday, £959 to £960.

Three Months—Thursday, £975 to £976; Friday, £971 10s. to £972 10s.; Monday, £968 10s. to £969; Tuesday, £965 to £965 10s.; Wednesday, £964 to £964 10s.

The Copper Institute has published details, shown in short tons, of the February copper production, etc. On the whole, the month does not make such a good showing as January. Production of refined copper in the States in February was 96,000 tons, compared with 100,270 tons in the previous month. Output of crude was 80,200 tons, against 83,200 tons in January. Deliveries to consumers last month were 104,800 tons, a big drop on the January figure of 130,430 tons, which was, of course, quite exceptional.

The copper supply position in the States seems to be decidedly tight and little or no relief is expected this year. With the other metals, however, there is some improvement. Lead is certainly in better trim and zinc is not so scarce as it was a few months ago. The outlook for aluminium, too, has improved with arrangements in hand for more metal from Canada later on. Some people foresee a glut in the light metal eventually.

Warning Against Industrial Unrest

Those attempting to cause industrial unrest as a protest against the Government's policy were warned by Mr. J. Tanner, president of the Amalgamated Engineering Union and a member of the General Council of the T.U.C., when he opened the women's conference of the A.E.U. at Eastbourne last week.

"The situation is very difficult," he said. "We may feel angry and exasperated—anxious to have a go, to get rid of this Tory Government, to prevent them from worse acts and measures that will worsen the living conditions of the people of this country. But we must use our common sense, maintain unity in our ranks and loyalty to the greater movement of which we are part."

Men Only Dinner

Last Friday, a most successful "stag party" was held at the Horse Shoe Hotel, London, in which 170 members and their male guests participated. There were no speeches, but the opportunity was taken to hand to the president of the London branch of the Institute of British Foundrymen, Mr. L. G. Beresford, an art casting of a frog as a small memento of his year of office. The evening programme, which was concluded by light entertainment, was organized by Mr. A. R. Parkes, who was warmly commended for his efforts.

During the proceedings, the president reminded members of two forthcoming events in the branch programme for which participants were invited, namely, the reception of an official visit from French Ardennes foundrymen, early in May, and a projected delegation from the branch to works in the Paris area at the end of June. Persons interested were asked to write to Mr. Parkes.

Midland Labour Shortage

After waiting nearly three months, a big Smethwick firm engaged on the defence programme is still able to use only some of its increased production capacity, and has plant standing idle because of the shortage of labour. The firm, the Birmingham Aluminium Casting Company, Limited, of Dartmouth Road, Smethwick, part of the Birmid Industries group, at the beginning of January asked the local Employment Exchange for 50 moulders, but so far have only been able to obtain half that number.